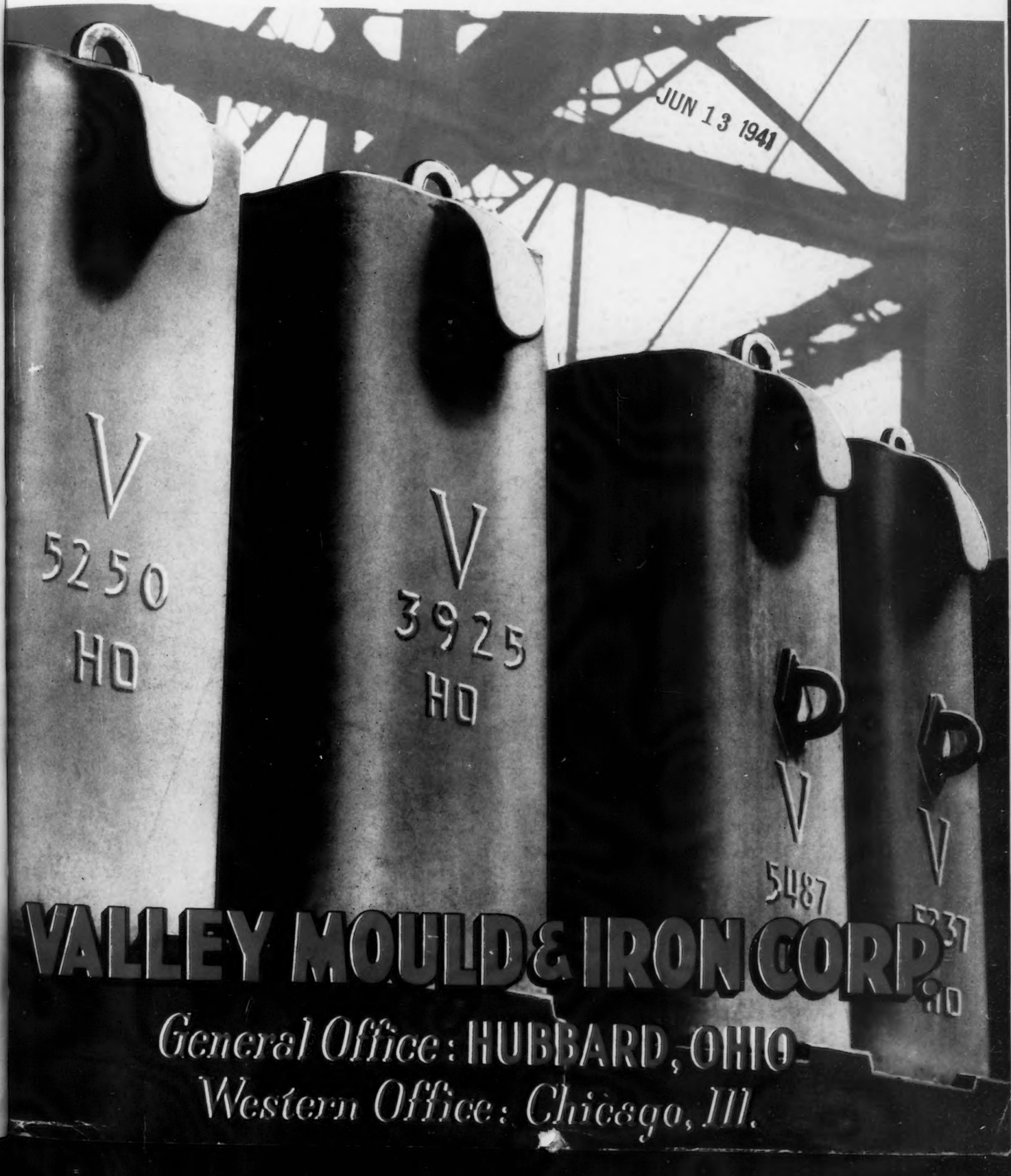
JUNE 12, 1941

The IRON AGE



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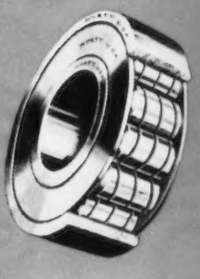

WHITING *Quiet-Running*

OVERHEAD TRAVELING CRANES

This Week in The Iron Age

JUNE 12, 1941

VOL. 147, NO. 24

Editorial

Technical Articles

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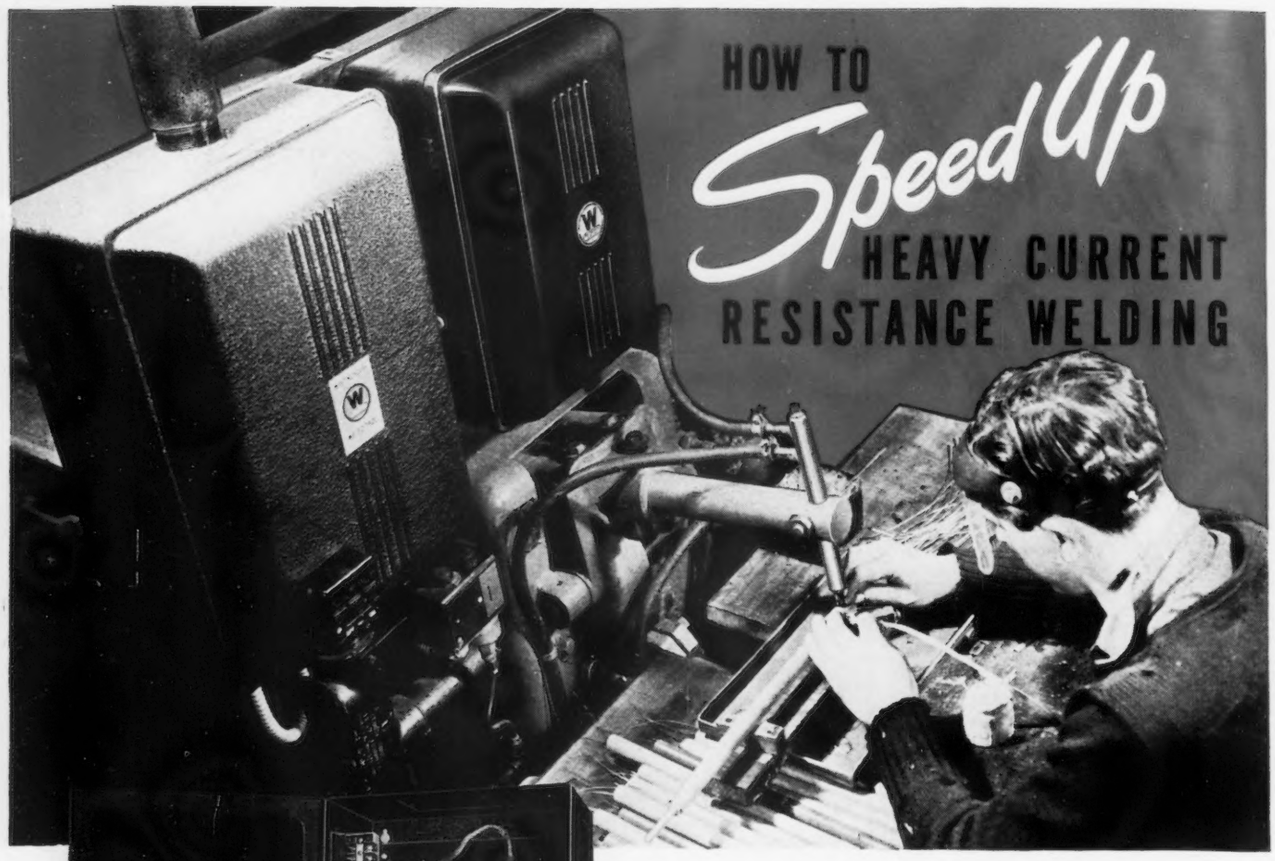

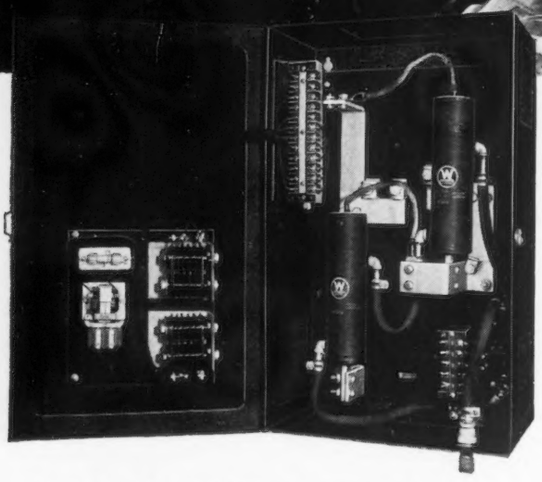

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The Iron Age

JUNE 12, 1941

ESTABLISHED 1855

Words and Deeds

I "see by the papers" that America is not as yet sufficiently aware of or aroused to the necessity of an "all out" effort in defense of Democracy. And I think I can tell you why.

It is not from lack of admonition. We have had plenty of that. The President has told us that every moment counts in this battle to save Democracy. Mr. Knudsen has told us that we are not doing nearly enough in the way of production. The chief economist of the OPM last week said that we must spend $40 billions per year, one-half of our national income, to catch up with Hitler. Mr. Batt, also of the OPM, says that our efforts must be doubled. Army authorities recommend scraping the cradles of America for cannon fodder by lowering the age of conscription to 18. Mr. Henderson tells us that we must give up buying automobiles and refrigerators. Senator Pepper says we should set fire to Tokio. Madam Perkins, the exception, hasn't said anything yet, but then, what could you expect?

No, it is not lack of admonition that is the cause of the lack of awareness. If admonition were all that were required to arouse a nation to a hell hot fury of fighting fervor, we have had enough of it to kindle the icebergs of Greenland, let alone to arouse the citizenry of this country.

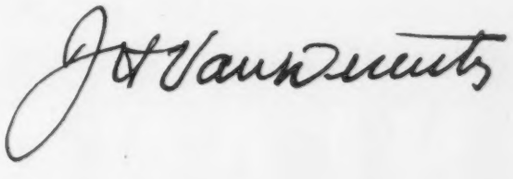
It is not a lack of exhortation that is keeping a large part of America on the seat of its pants instead of bringing it up on its toes. It is a lack of consistency.

Americans, as a class, are sticklers for consistency. They want to know, when a man says something, whether or not he really means what he says. So they match words with deeds, or rather they try to match them. If they cannot find the deeds, they discount the words. We are practical people.

Mind you, the vast majority of Americans are willing to take in their belts for an all out defense program, let the chips fall where they may. The vast majority of the employers and the workers and the consumers of this country are ready to give all that is in them or in their pockets, too, to help arm America and to help England win. But their innate spirit of consistency stops them from that all out effort.

They may say to themselves: "It must be that the people in Washington are just talking for the effect that their words may have on Hitler. Surely it cannot be as serious as they say, otherwise they would not tolerate for a moment such strikes as are now delaying our shipbuilding and other programs. And the Administration has not as yet even slapped these fellows on their wrists."

Three little words would electrify and unify America and bring it united to its toes. They are "Stop these strikes!" But they would have to be followed by the necessary deeds.



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In these critical days, when quick and specific results are imperative, America must make full use of the best it possesses in expert training and experience. That is why we urge you to take advantage of the knowledge of Inland metallurgists.

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Carburization and Decarburization

—What are the factors affecting surface carbon at elevated temperatures, and what practices minimize carbon changes? The observations herein give these answers, and thus should be of value to all those plants heat treating or otherwise handling steels at high temperatures.

By F. A. LOCHE
Syracuse, N. Y.

ALTHOUGH the problem of preserving the original carbon content in the exterior layer of a steel being heated to elevated temperatures has always existed, it has become increasingly important during recent years. Control of the factors affecting changes in surface carbon in steel at elevated temperatures has become essential in order to meet customers' specifications and competition.

An increase of carbon content in the surface of a steel—carburization—is a very old and much studied process. The reverse of this, or loss of carbon from the surface of the steel—decarburization—while actually being equally as old as a carbon change as carburization, it has only recently become the subject of much study and discussion. In order to protect a steel when heated to elevated temperatures from being affected by either or both of these two carbon changing processes, it is necessary to understand the factors affecting changes in surface carbon in steel at elevated temperatures.

Consider first an increase of surface carbon or carburization. Carbon is present in steel in the form of carbides, usually iron carbide (Fe_3C), or it may form carbides with other alloys present such as chromium, etc. In a steel already containing carbides, the iron of the steel does not have any affinity for combining with any additional carbon to form carbides until the critical temperature is reached upon heating (generally about 1340 deg. F. for plain carbon steels). An increase of surface carbon, or carburization, is known to be a function dependent on several factors:

(1) Composition of the material undergoing treatment.
(2) The temperature of the treatment.
(3) The length of time at that temperature.
(4) The characteristics of the agent producing the increase of surface carbon.

This discussion will pertain mainly to the characteristics of the carburizing agent to which the material is exposed. However, it should be mentioned that the following rules roughly apply to the other factors:

(1) For any given time and temperature, the ease of carburization varies inversely as the original carbon content of the material (low carbon steels pick up carbon comparatively easily).
(2) An increase in the temperature (upper limit approximately 1800 deg. F.) will produce more carbon pickup and deeper penetration.
(3) For any given temperature, an increase of time at that temperature produces an increase in the absorption of surface carbon and also deeper penetration into the surface of the steel.

Consider next the characteristics of the agent promoting the carbon pickup. It is the purpose of this article to discuss the factors which influence surface carbon changes of steel at elevated temperatures where such changes are not intentional or planned, but rather where the aim of the process is to maintain the original surface carbon. Years ago, it was believed that in carburizing, solid carbon passed bodily from the packing material

into the metal. However, more recent investigations have shown that the transfer of carbon from the carburizing agent to the metal, is accomplished mainly by gases containing carbon. The main two gases capable of transporting and yielding carbon to the steel are carbon monoxide (CO) and methane (CH_4). Thus, any atmosphere containing either or both of these gases would have the possibility of adding carbon to the surface of the steel under favorable conditions of contact, time and temperature. The effect of impurities in such an atmosphere will be discussed later.

As regards carbon being removed from the surface of the steel when heated to elevated temperatures, this phenomenon generally occurs under similar conditions of time and temperature as are required to produce an increase of surface carbon. That is, the steel must be heated to, or above the critical temperature of the steel. It should be mentioned that it is possible to alter the surface carbon content of the steel at temperatures slightly below the critical temperature of the steel, provided sufficient time is given at that temperature. However, the factors governing these changes apply at all temperatures, so discussion will be limited to the critical temperature range. Loss of surface carbon, or decarburization, is known to be a function dependent on the following factors:

(1) Composition of the material undergoing treatment.
(2) The temperature of the treatment.
(3) The length of time at that temperature.
(4) The characteristics of the agent producing the loss of surface carbon.

Discussion will pertain mainly to the nature of the decarburizing agent. However, the following rules roughly apply to the other factors:

(1) The ease of decarburization varies directly as the original carbon content of the material undergoing treatment (high carbon steels generally decarburize comparatively easily).
(2) An increase in the temperature will produce more decarburization.
(3) For any given temperature, an increase in time at that temperature produces an increased amount of decarburization.

Gas Is Responsible

As in the case of carburization, the agent responsible for decarburization is gas. Chemically speaking, the iron carbide can be broken up by two methods, either oxidation or reduction. Oxidation of the carbide can be accomplished by oxygen or any gaseous compound containing oxygen, which may break up at elevated temperatures and liberate oxygen. Thus, oxygen (O_2), water vapor (H_2O) and carbon dioxide (CO_2), (listed in order of oxidizing action), will have the power to attack the iron carbide by oxidation. The atmospheric reduction of the carbide is accomplished by hydrogen (H_2), and moisture must be present in order for hydrogen to have this reducing power. Moist hydrogen is a strong decarburizer, while dry hydrogen is comparatively inactive. This would seem to imply that the oxygen of the moisture serves as a catalyst to this reaction. A tabulation of the gases capable of removing carbon from the surface of steel under favorable conditions of contact, time and temperature, is as follows: O_2, H_2O, CO_2, and H_2 (moist).

As a matter of interest, it should be worthwhile to note the effects of different combinations of these gases having the power to alter surface carbon. Of particular interest is the effect of the H_2O/H_2 ratio and the CO_2/CO ratio of atmospheres in contact with steel at elevated temperatures. It has been found that at 1300 deg. F., a ratio of H_2O/H_2 of greater than 0.40 will oxidize steel. At the same temperature, a ratio of CO_2/CO of greater than 0.65 will oxidize steel. Oxidation under these conditions means converting both the iron and the iron carbide of the steel to their respective oxides or more commonly called scaling. However, it is possible to preferentially oxidize or reduce the carbide of the steel without materially affecting the iron of the steel, or in other words, decarburize without appreciable scaling. This is a metallurgical phenomenon attributed to several factors:

(1) Migration of the carbides at elevated temperatures.
(2) Penetration of oxygen and hydrogen into the surface of the steel.
(3) The stability of the carbide.

It is not within the scope of this article to discuss whether decarburization is accomplished by the carbide migrating to the surface of the steel and there being attacked, or whether oxygen and hydrogen actually penetrate into the steel to successive interfaces to attack the carbide. It is sufficient to know that oxidation of the carbide does occur at considerably lower ratios of H_2O/H_2 and CO_2/CO than previously mentioned, and that the amounts of H_2 and CO present should be at least ten times as great as the amounts of H_2O and CO_2, respectively, in order to be comparatively safe from decarburization by H_2O and CO_2 in any given atmosphere.

To produce a passive atmosphere which will not greatly alter the surface carbon content of a steel undergoing treatment at elevated temperatures, O_2 must be entirely eliminated; CO_2 and H_2O should be eliminated or reduced to a safe minimum in conjunction with the amounts of H_2 and CO present, and CH_4 should be eliminated or reduced to a safe minimum. This promotes the conclusion that an atmosphere in order to be passive to steel at elevated temperatures must be composed largely of an inert gas such as nitrogen (N_2). This will be discussed in greater detail later in consideration of muffle or retort-type of protection during the heating and cooling of a steel.

Although recent investigations have provided much information about the factors promoting a gain or loss of carbon from the surface of the steel at elevated temperatures, it is not always practical in heating and cooling steel in some processes to spend time and money to control these factors. Most heating and cooling of steel is conducted in furnaces of two types: open-fired and muffle or retort. In an open-fired furnace, the products of combustion of whatever fuel is being used come in direct contact with the steel being heated. A retort-type furnace provides a container into which the steel being heated is placed, and the products of combustion of the fuel do not come in contact with the steel.

As regards the open-fired furnace (excluding electricity), this type of furnace may be fired by solid, liquid or gaseous fuels. Since in this type of furnace, the products of combustion of the fuel being used come in direct contact with the steel, any changes in surface carbon will be promoted by this atmosphere. There are two factors which affect this atmosphere; one being the degree of combustion, and the other being the chemical composition of the fuel being used.

A primary requisite for combus-

tion of any fuel is the intimate contact of particles of air (oxygen) with the particles of the fuel, or commonly called, atomization of the fuel. Gaseous fuels lend themselves most readily to this atomization, with liquid fuels such as fuel oil being more difficult and solid fuels such as coal, being the most difficult to atomize. Thus, complete combustion is obtained comparatively easily with gaseous fuels and is increasingly more difficult to achieve with liquid and solid fuels.

The atmospheres produced by burning these fuels will inherit these characteristics (dependent on the efficiency of the furnace and operator, etc.). The atmosphere from the combustion of a solid fuel will possibly contain some unburned fuel such as particles of carbon and carbon monoxide gas, while the atmosphere produced from burning a liquid or gaseous fuel will probably contain the products of complete combustion, that is, water vapor and carbon dioxide. From the standpoint of combustion, an atmosphere produced by the burning of a solid fuel such as coal, will possibly be carburizing, while atmospheres produced from burning oil or gas will likely be decarburizing, with gas-fuel atmospheres being the worst offender of these two.

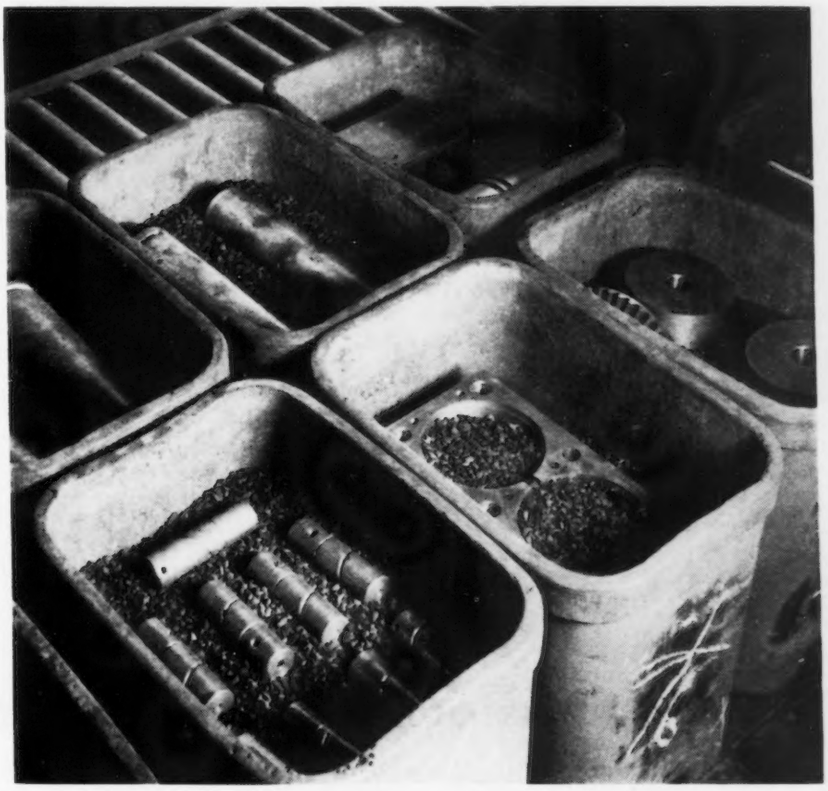
Fuel Composition Important

The chemical composition of the fuel is another important factor in the types of atmospheres produced by the combustion of these three types of fuels. For example, coal contains very little hydrogen, as it is mostly carbon. Oil contains twice as much hydrogen as coal, and natural gas contains the most hydrogen of the three. Combustion of hydrogen produces water vapor, which has greater decarburizing power than carbon dioxide produced by the complete combustion of carbon. From the standpoint of chemical composition, an atmosphere produced by burning coal would have less tendency to decarburize than an oil-fuel atmosphere, which would have less decarburizing power than a natural gas-fuel atmosphere.

In open-firing, most furnace operators choose to maintain a smoky flame, insofar as it is possible in that particular operation. The idea, of course, is to have present some unburned fuel, and such an atmosphere will scale very little and supposedly prevent decarburization. However, it should be kept in mind that a scale piece is generally not as much of a loss as a decarburized piece. Therefore, if the product can possibly stand a scale, it is better to fire with a slight excess of air and obtain complete oxidation of the affected layer of steel, permitting the scaling to absorb the decarburized area and remove all of this by pickling. With an atmosphere containing some small amount of unburned fuel in combination with CO_2 and H_2O vapor, which has only a limited oxidizing power, there is likely to be considerable decarburization and only a slight amount of scale, and some of this decarburized layer will remain after the scale has been pickled off.

Retort-type furnaces may or may not be operated with a prepared atmosphere within the container. Discussion will deal with those cases where a specially prepared atmosphere is used within the container to protect the steel from changes in surface carbon. The two most popular types of atmospheres today are dissociated ammonia and partially combusted fuel gases.

It might be of interest to first examine dissociated ammonia (NH_3), which is composed of 75 per cent hydrogen and 25 per cent nitrogen. Because of the strong decarburizing action of moist hydrogen, this gas must be bone dry to be successful. This is generally accomplished by passing the gas through chambers containing activated alumina which will absorb all the moisture present, and also absorb any undissociated NH_3, which is also undesirable. A completely tight retort, liquid sealed, is necessary for use with dissociated ammonia because of the danger of moist hydrogen which would result from the hydrogen of the atmosphere combining with any oxygen present to form water vapor. Since there is no carburizing component present in this gas, the only change than can take place in the amount of carbon in the surface of the steel from unsuccessful practice, is a loss of carbon, or decarburization. Dissociated ammonia when correctly used is passive to steels because of



PARTS shown here to be carburized in the plant of Lindberg Steel Treating Co. are packed in metal containers with a mixture of charred bone, charcoal, leather, or even such materials as peach stones, with an energizer such as barium or sodium.

the presence of inert nitrogen (dry) and the fact that dry hydrogen is also comparatively inert.

The other popular type of atmosphere is generally prepared in a separate unit by the partial combustion of a fuel gas such as natural gas. The products of combustion CO_2 and H_2O are removed, leaving a gas containing CO, H_2, CH_4 and N_2. The amounts of each of these present are governed by the degree of combustion. It is possible by regulating this combustion to produce a gas composed almost entirely of nitrogen, with only a small amount of CO and H_2 present. The same decarburizing facts apply to hydrogen and the combination of hydrogen and H_2O vapor being present in this gas as in the case of dissociated NH_3. The other active component of this type of atmosphere gas is CO, which will carburize. As in the case of dissociated NH_3, a tight retort is necessary for use with this type of gas as any oxygen present will unite with the H_2 and CO to form H_2O vapor and CO_2. However, it is permissible that the seal or retort be less efficient with this gas than with dissociated NH_3, as the carburizing components. CO and CH_4, if present, will tend to balance any decarburizing components within certain limits. Due to both CO and H_2 being present, unsuccessful use of this type of atmosphere gas can result in either carburization or decarburization of the steel undergoing treatment.

Assuming it is practical to manufacture pure nitrogen for use as protective gas, the merits of such an atmosphere should be considered. Use of atmospheres within a retort requires a flushing and scavenger action to either push out or consume any oxygen present due to air and moisture trapped during loading and sealing of the retort, or due to an inefficient retort or seal. Pure nitrogen is inert and would not react with any oxygen present, so that such an atmosphere gas could only overcome these impurities by mechanically flushing them out of the retort. However, if some H_2 or CO, or both, are present in a gas being used as a protective atmosphere, they can chemically unite with the oxygen. Thus H_2 and CO act as scavengers, and an atmosphere gas containing these two constituents has the property of both flushing out and consuming any oxygen present.

In conclusion, the following points are listed as the main factors affecting surface carbon in steel at elevated temperatures:

(1) The gases CO and CH_4 produce carburization.

(2) The gases O_2, H_2 (moist), H_2O and CO_2 produce decarburization.

(3) H_2 and CO should be present in amounts ten times as large as the amounts of H_2O and CO_2 respectively, in order to be comparatively safe from decarburization by H_2O and CO_2.

(4) It is possible to preferentially attack the carbide of the steel without materially affecting the iron of the steel, or decarburize without scaling.

(5) In open-firing, it is better to create an oxidizing atmosphere and allow the scaling to absorb the decarburized areas, than to operate with a reducing atmosphere which produces only a limited amount of scaling accompanied by decarburization which is not removed in pickling.

(6) The use of dissociated ammonia, as protective atmosphere requires a liquid sealed retort and complete dryness of the dissociated ammonia.

(7) The use of partially combusted fuel gases as protective atmospheres permits a less efficient seal and retort than are required with dissociated ammonia. However, this type of gas can produce both carburization and decarburization.

(8) Pure nitrogen as a protective atmosphere must be used in comparatively large quantities as it can only overcome any oxygen present by a mechanical flushing action. The other alternative when using pure nitrogen, is to purge with some other gas which is comparatively less expensive and more active.

Crystal Structure Changes in Rolled Copper

HOW the texture present in severely rolled copper is developed is indicated by the results of a study recently completed by H. C. Vacher at the National Bureau of Standards, according to an announcement by the Department of Commerce.

The history of the changes in structure that an individual crystal undergoes during the development of texture by cold rolling is of considerable interest to metallurgists. The determination of these changes in the crystals in copper available commercially, however, is impossible because of their small size. In the study this difficulty was circumvented by using relatively large monocrystalli specimens.

Continued cold rolling causes the shapes of individual crystals or fragments of crystals in polycrystalline copper to approximate a ribbon, the principal changes in dimensions being similar to those of a billet as it is rolled into a strip. Simultaneously with these changes in shape, the crystallographic axes change their positions so that certain preferred orientations are attained. The structure resulting from these changes in shape and orientation is called texture.

The results of this investigation have shown that some monocrystalline specimens, when cold rolled, develop two or three layers which are approximately parallel to the plane of rolling. Whether or not a monocrystalline specimen divides into a few layers depends upon its initial orientation. The changes in orientations which occur in either case are similar. These changes indicate that cold rolling rotates the crystal lattice around an axis nearly parallel to the transverse direction, to a position approximating one of five intermediate orientations. Continued rolling after an intermediate orientation has been approximated causes it to change into the preferred orientations characteristic of polycrystalline copper that has been cold rolled severely.

The shape of the layers which formed in some monocrystalline specimens during cold rolling is similar to the ribbon-like shape of crystals or fragments of crystals in polycrystalline copper that has been cold rolled severely. This similarity in shape indicates that changes in orientations, which occur simultaneously with changes in shape, are also similar. Therefore, the results from monocrystalline specimens can be used to describe the development of texture in ordinary copper by cold rolling.

o o o

NEW loading dock. Monorail spur tracks built by American Monorail Co., Cleveland, serve the entire dock area to each of six truck pits. Motor trucks may be seen in the background at left. A 2-ton Euclid electric hoist on a bridge crane serves the dock area.

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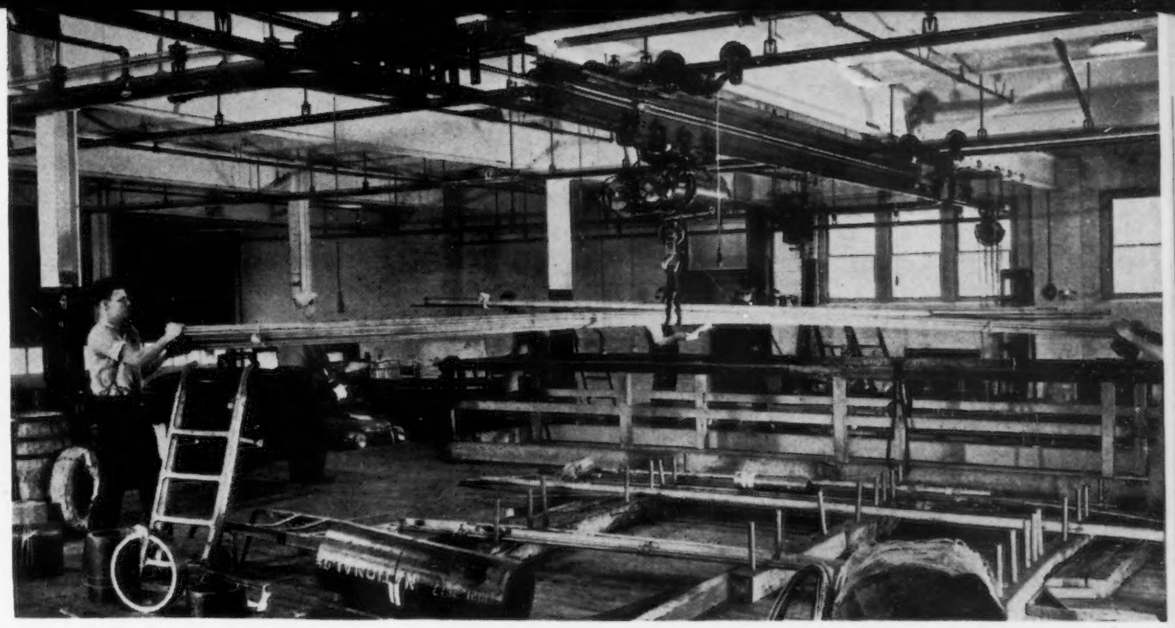

New Handling Technique for Warehouse

UP until a few months ago Strong, Carlisle & Hammond Co., Cleveland, steel warehouse and dealer in mill supplies, used to unload incoming shipments at the street curb and move material with much hand labor into basement storage. Unloading was thus a traffic nuisance, costly and time consuming. It was necessary to repeat the process in loading trucks out of stock.

All this is changed now with the creation of a modern loading dock capable of handling six trucks at once, served by a power hoist and American Monorail equipment and hand hoists in the basement storage departments. It is stated that savings have been very great.

The new layout is explained in the accompanying photographs.

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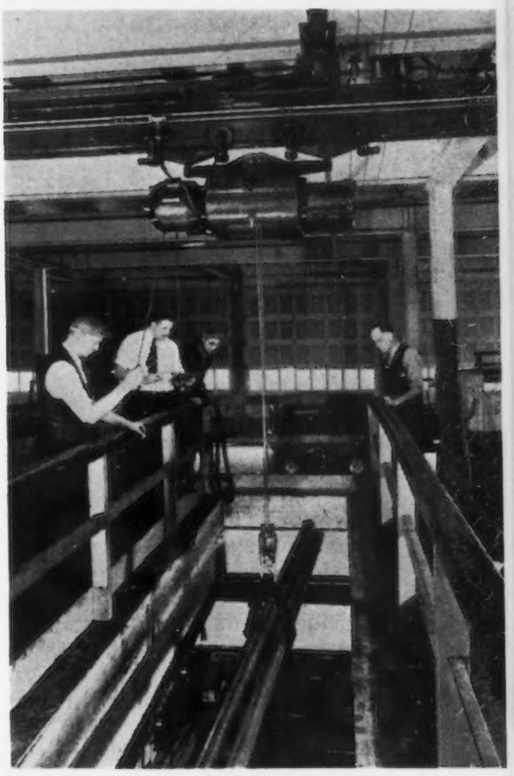
FROM the trucks the supplies are hoisted down a hatchway to the basement storage departments.



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CUTTING department for tubing, showing saws and roller table and also showing how hand hoists and monorail equipment serve this department.

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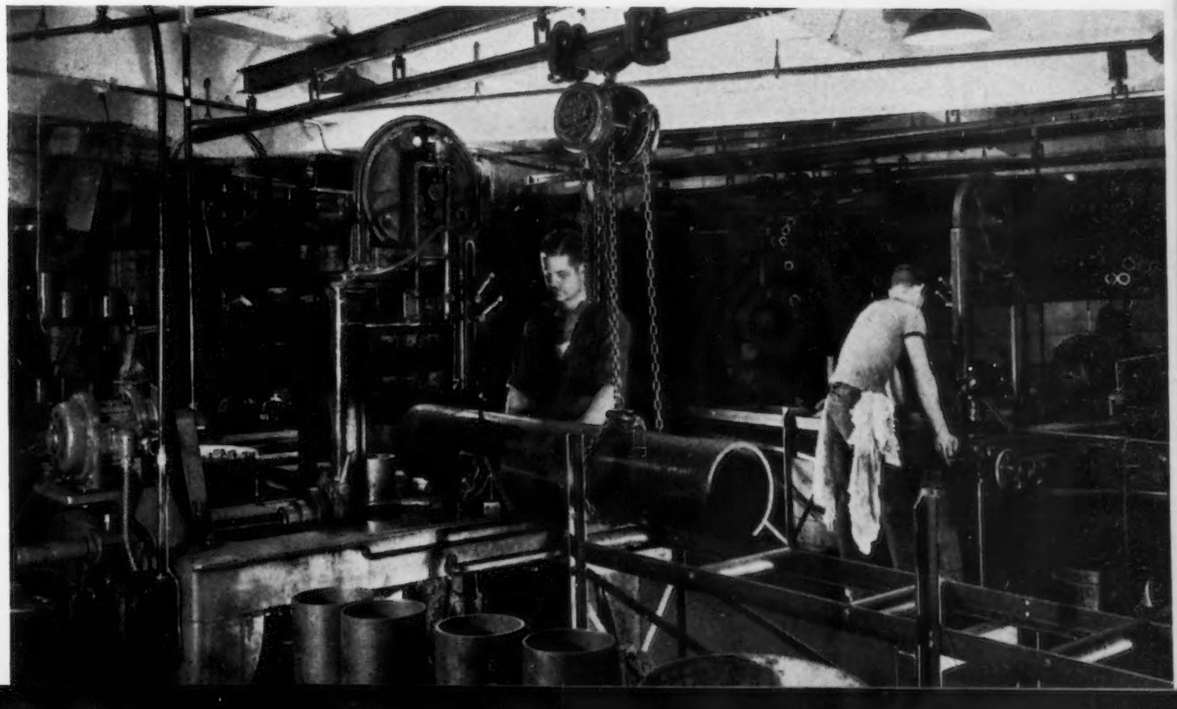


Inspection of Aircraft

THE initial purpose of an aircraft X-ray laboratory is usually visualized as a means for examination of cast parts, and cast parts exclusively. So well established is this field of testing, that few people realize the vast range of X-ray applications in the solution of innumerable other aircraft problems.

More often than not, the primary reason for the establishment of a radiographic laboratory is so submerged in a host of miscellaneous applications that it becomes relatively unimportant. Probably as vivid an illustration as any of this situation is the story of the work now being done in the Bell Aircraft Corp laboratories.

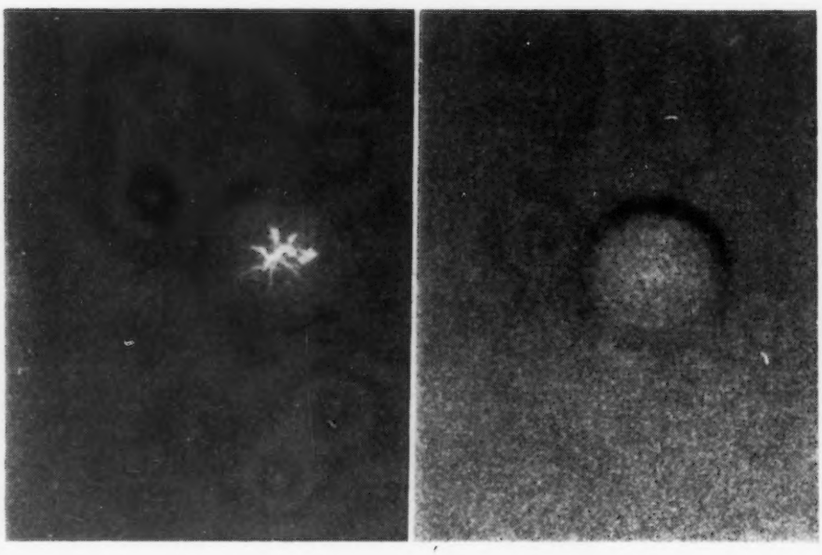
The X-ray equipment was originally designed and built for strict coordination with government specifications which require radiographic inspection of cast structural parts. The company was sufficiently foresighted, however, to provide room and facilities for both expansion of work and for research oportunities. The apparatus consists of two separate generating outfits, one a stationary valve tube rectified unit and the other a mechanically rectified machine mounted on a pneumatic tired trailer which makes it fully portable within almost any desired radius. An extensive and varied field of materials can easily be X-rayed by these equipments, for one has a range of 30,000 to 210,000 volts and the other can be operated from 220,000 volts down to a potential of well under 20,000. Both outfits are completely equipped with a full line of the most modern high and low voltage tubes, meters, and other miscellaneous pieces of X-ray equipment. It may also be noted that the company technicians have especially adapted this equipment in order to better utilize the facilities.

The average engineer or inspector in any field of precision work is anxious to solve his problems by the easiest and yet the most thorough method placed at his disposal. As a result, hundreds of new problems are submitted to the X-ray laboratory weekly, and while they cannot all be solved by this form of inspection, each one widens the scope of X-ray in the aircraft industry.

Perhaps foremost among the miscellaneous X-ray applications is the control and improvement of spot welding practices. Welding engineers are looking forward to the time when many parts, which now require countless rivets, may be effectually assembled by this process. Aluminum, the most widely used metal in aircraft construction, has given welding engineers considerable trouble and much care must be exercised to obtain perfect welds. Hundreds of samples of the same gage and material, to which various pressures and potentials have been applied, must first be stress tested and sectioned for micro-examination. This lengthy procedure is to insure a weld of the highest type, but in spite of precautions taken, the variation in machines and the necessary speed of production cause some faulty welds to escape detection. While ordinary visual inspection will find surface defects, radiographic examination will disclose internal as well as external flaws with a high degree of accuracy. Because of its effectiveness, welding engineers are using this thorough and inexpensive method not only to inspect spot welds but all other types of welding.

Fig. 1 contains prints of the X-ray negative of two spot welds in aluminum sheets. On the surface these welds were identical. No sign of the worth of the weld could be obtained, but under the X-ray, faults were clearly discernable. These pictures were taken with ordinary X-ray technique and en-

FIG. 1a (Left)—A poor spot weld with aluminum sheets. Fig. 1b (right) A considerably better spot weld.



ft Components

By R. C. WOODS
Physicist, Bell Aircraft Corp., Buffalo,
and
T. M. NOLAN
Laboratory Engineer

larged five diameters in order to demonstrate the effectiveness of this inspection. Fig. 1a shows a poor weld in which several cracks and bursts are noticeable in the center of the weld; and, Fig. 1b, taken with the same procedure and enlarged to the same size shows an improved weld. A wider range of this type of work is now being done along the micro-radiographic lines by means of an X-ray diffraction tube.

Gas and arc welds of all types have been for a long time subject to this particular examination not only in aircraft production, but in many other industries as well. Frequently a quick check on the quality of a welder's work is necessary. Without resorting to any other method, X-rays can give a complete picture. The new welder's technique may be studied and the old welder's technique checked from his actual production output, without resorting to more numerous and lengthy tests.

—In the aircraft field, the X-ray has come into its own. Here, the authors show how the X-ray laboratory can solve many unusual and difficult production problems

Fig. 2 shows several examples of arc welding in which a steel sheet and tube have been bonded. Here again, the difference between the good and the bad welds are easily detected. There is perhaps no other method now in common practice that will give as complete a result as X-ray inspection.

Everyone knows to what great lengths inspectors must go to be sure the thousands of small rivets in an airplane's structure are capable of withstanding the stresses applied to them. Riveted parts are checked and rechecked for improper peening and cracks which may later cause direct failure in service. Therefore, it seems only logical that X-ray examination should be added to the inspection of so vital a part. Careful manipulation of film and voltages enables riveted structures of all types, even to the examination of a completed fuselage, to be thoroughly inspected. The small cracks which sometimes develop in the material under the head of a rivet are easily discernable by this radiographic examination. Countless riveted parts are tested by X-rays because it is the only non-destructive method now known.

A demonstration of this inspection is found in Fig. 3. Here, for

FIG. 2—Several examples of arc welding in which a steel sheet and tube have been bonded.

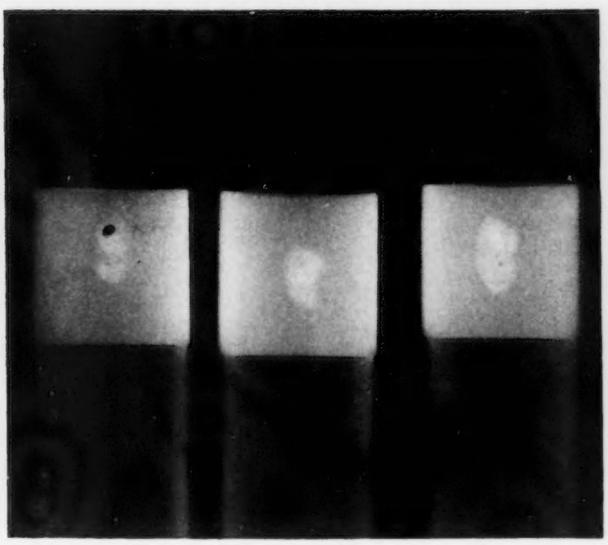
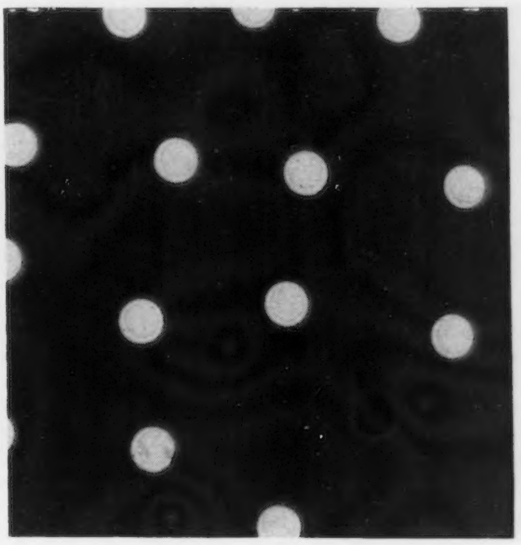


FIG. 3—This view shows two sheets of aluminum which have been riveted together by the approved method.



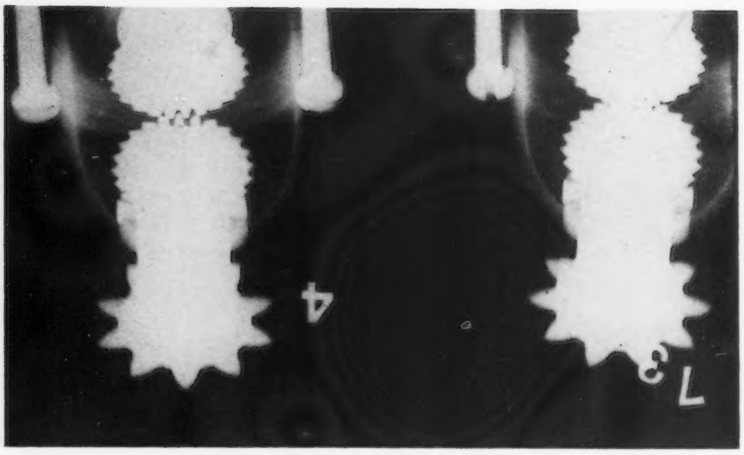


FIG. 4—Trim tab gear box; imperfect mesh (left) and good mesh (right).

the purpose of illustration, two sheets of aluminum have been riveted together by the approved method. It may be noted how clearly the rivets and the sheets they are holding together are shown. While these pictures show no defects whatsoever, it is obvious that these defects, if present, would be clearly shown.

Perhaps some readers have wondered just how the gears meshed inside a gear box or how much clearance there is between the gears and the housing. Of course, these items can be checked from the various drawings, but there still remains a doubt as to whether they were machined to the proper tolerance and assembled correctly. With new techniques developed in the laboratory, Bell Aircraft is now X-raying its trim tab gear boxes 100 per cent (see Fig. 4). Nor is there any doubt in the minds of inspectors that the gear boxes that go into one of the world's fastest ships are improperly constructed. Special jigs have been built to hold the gear boxes at various angles so every gear may be accurately checked to see that it has the proper mesh, the right amount of clearance between the housing walls, and the proper alignment of the shafts.

Furthermore, these techniques are not applicable to gear units alone, for fully assembled parts such as gun mounts, shock absorbers, electric motors, bearings, and hundreds of other miscellaneous items can be X-rayed readily.

Shock absorbers, either for machine gun mounts or landing gear, can be checked to see just how their parts operate under actual working conditions, electric motors are checked to discern the wiring and many other assembly factors. Position of the various parts in an assembled mechanism is not the only fact unearthed by a radiographic examination, because the quality of the material is simultaneously inspected for interior cracks and other defects.

The introduction of plastics opened a large field for the industrial X-ray engineer. Plastic parts such as trim tabs, pulleys, etc., or parts containing plastics such as radio tubes and insulators are far too numerous for individual mention. Pieces of metal are imbedded or mounted in some opaque plastic and how these pieces are arranged internally is not discernable by eye (see Fig. 5). Here again, X-ray steps in and permits a thorough examination. Plastics, being of a very low density, enables the radiographer to take such a distinct picture that even the distances between such objects can be measured with a high degree of accuracy. Then, too, it is sometimes desirable to see the composition of the plastic. Many of these, as it is commonly known, contain fabric molded into the composition in its initial stages; this too is readily visible by the use of X-rays (see Fig. 6).

Another interesting example of the flexibility of X-ray equipment is its aid to men in research fields. There is available in the laboratory a fatigue tester of the Rayflex type, which vibrates rods, strips, and other suitably prepared samples until the crystaline structure fails through sheer fatigue. A contact is arranged in such a way that upon failure of the specimen, the machine automatically stops. Recently, while running an extensive test on small bars of various types of material, certain specimens would stop vibrating. While there was no apparent failure that could be found on the surface, it was impossible to get the pieces to vibrate. Was it possible that the machine wasn't operating properly? Could the specimen have failed internally? Should be specimen be sectioned for micro-examination and thereby make it useless even if it should not be defective? Many were the questions which arose in the minds of the research men. Finally, it was suggested that they resort to X-ray examination before the specimens were ruined by sectioning. It was tried and found that tiny cracks were evident in the center of the bars. While only one incident has been cited where radiography helped solve a perplexing problem, it can readily be applied to many other physical and chemical problems such as stress analysis, extreme cases of chemical segrega-

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FIG. 5—Plastic pulley. This shows the results of the bond of the steel core to the plastic.

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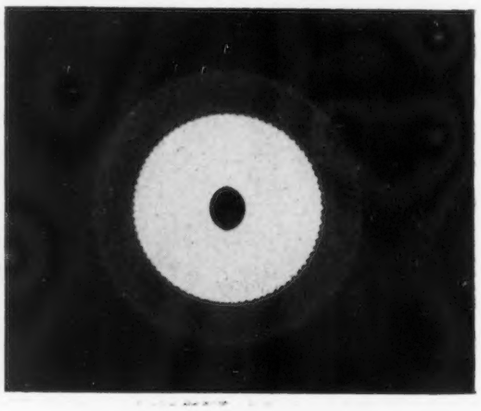

tion and the observation of flow lines in forgings.

It has been the purpose of this article to show the varied uses of a radiographic laboratory in the aircraft industry. Furthermore, while it was impossible to mention all the miscellaneous applications this laboratory has served, the authors sincerely hope enough has been mentioned to suggest to the average engineer or inspector the ever increasing scope of this field.

In view of the fact that numerous articles have been written concerning the application of this method to the inspection of castings and forgings, no detailed mention of this subject was made. Almost every foundryman is acquainted with the benefits he can derive from X-ray examination. Foundry men clearly realize that they have increased the value of their product to such a great extent that castings now can be used in many places where they could heretofore not be used due to the uncertainty of specific types.

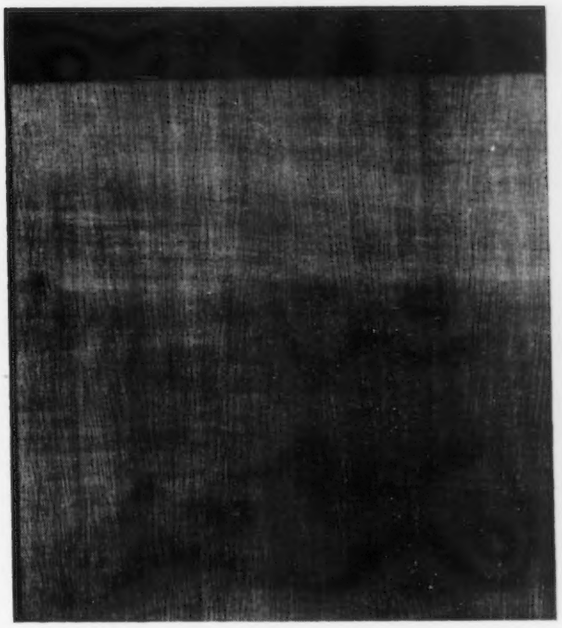

FIG. 6—Plastic composition; this X-ray shows fabric molded into the plastic.

These laboratories, in an ever continuous research program aimed at the discovery of new X-ray applications, sincerely hope they have in some small way added to what the engineers in the aircraft and other laboratories have already accomplished.

Magnetic Hardness Testing of High Speed Steels

THE effective life of a cutting tool, that is, its ability to retain its cutting properties in service, is a fundamental property of high speed steels which is determined by a variety of factors inherent in the tool steel itself, the physical and mechanical properties of the work piece, and the conditions of machining. Hardness of the tool steel is an important criterion in this respect, but the Rockwell and Vickers hardness values are not satisfactory bases of comparison for these steels, since there is no simple relationship between the indentation hardness and the effective life of a tool.

In recent research on this problem, discussed by H. SPRINGER in the "Zeitschrift des Vereins deutscher Ingenieure," the value of magnetic methods of measurement has been investigated in collaboration with the Reichs-Röntgenstelle of the Staatliche Material-prüfungsamt, Berlin-Dahlem, from which it appears that such measurements give an indication of the quantitative influence of heat treatment on high speed steels as well as a numerical value expressing the relationship between hardness and effective tool life.

Such a relationship appears to be reasonable, since the annealing of steel is associated with certain textural changes which closely affect, among other things, the magnetic characteristics, so that magnetic measurements should be related in some way to the hardness of the steel, especially if it is possible to establish the relationship between the magnetic values and the textural changes due to heat treatment. In the work described, an a.c. bridge with galvanometer was used, the measuring coil being suitably adapted for insertion of the test piece. Measurements were made of low magnetic field strengths, the permeability of a standard specimen being compared with that of various samples, each of which had received a different heat treatment. These measurements showed that the magnetic properties were closely related to the annealing temperature, the time the sample was kept at this temperature, and the rate of cooling. By making two of these magnitudes constant, the effect of varying the third was examined experimentally, providing a method for measuring the hardness by studying the magnetic behavior.

Investigations with hardened test pieces indicate that with these the magnetic properties are not so directly related to the effect of heat treatment, possibly owing to the structural transformations occurring, since the magnetic properties after tempering are closely related to the behavior after hardening before tempering. The cause of changes in magnetic permeability lies in the formation of non-magnetic austenite on heating the steel; on tempering, the austenite is again transformed to magnetic martensite, which, however, decomposes further on raising the tempering temperature. Magnetic measurements on tempered specimens showed that, as with the hardened pieces, the tempered state is also determined by the same three factors as mentioned above. With care and a careful supervision of the various stages of heat treatment, the effective tool life of tempered specimens can be deduced with the same reliability as for hardened pieces. The results of measurements must, however, be statistically evaluated to arrive at reliable mean values for specific heat treatments, using standard specimens to simplify comparison.

How To Plate

Metals on Non-

By ADOLPH BREGMAN
Consulting Engineer, New York

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ELECTROPLATING is now over 100 years old. However, metal finishing, in every sense of the word, is undoubtedly thousands of years old, including as it does all classes of surface treatment, mechanical as well as chemical and electrolytic. The earliest applications of metal coatings were on metals, but with the coming of the Age of Industry, it was only a question of time before the search would begin for methods of applying metals to non-metallic products; and, of course, also only a matter of a little more time before such methods were discovered.

To be sure, some examples have been found by archeologists of metallized wood and terra cotta made by the Egyptians by methods unknown. However, outside of mechanical sheathing of such objects in sheet metal, no practical method was available for metallizing non-metallics until 1837 when H. Jacobi exhibited samples of metallized articles, non-adherent coatings which could be separated from the base, for use as a negative mold. At this time, a number of other workers in England, including Thomas Spencer and J. C. Jordan, were experimenting with the same problem. In 1840 Robert Murray applied graphite to non-metallic surfaces to make them conductive to electricity, and later reproduced engraved copper plates by this "galvanoplastic" method. In 1841, Alexander Jones obtained a patent for sensitizing to render conductive, the surfaces of lace, wood, leather, porcelain, glass, etc., by the application of copper. In the same year, Alexander Parks was granted a patent for metallizing animals, insects, flowers and fruit by the application of a silver nitrate solution. The silver nitrate formed a part of many other processes, which varied simply in their methods of application. For example, a patent obtained by Noualheir and Provost in January, 1857, described the metallization of a soft surface such as a human corpse (!) by placing the body in a suitable attitude and spreading pulverized silver nitrate over it with a brush; then electroplating it in a copper sulphate bath, thus producing a copper plated mummy. The following years saw numerous patents for the electrolytic deposition of metal on all types of non-metallics.

Today, by far the largest single use of the process of galvanoplasty in point of volume, is electrotyping —the reproduction of set type, either reading matter or illustrations, by electrodeposition upon wax or lead molds, the process involving in each case, coating with graphite. But the actual number of non-metallic consumer products upon which metals can be and are being deposited, is legion. It is sufficient to point out that metal is plated on terra cotta, plaster of paris, concrete, clay, pottery, cloth, leather, lace, flowers, leaves, insects, animals, wood and most recently, almost the whole line of present-day compositions and plastics. The almost endless variety of non-metallic products, including plastics, which can be electroplated is illustrated by the list below:

NOVELTIES

Ash trays, bag frames, bracelets, buttons, cigarette cases, cigarette lighters, combs, compacts, containers, costume jewelry, fountain pens, jar tops, mirrors, pencils, poker chips, plastic beads, razors.

INDUSTRIAL

Cams, faraday cages, handles, instruments, machine parts, reflectors, rollers.

[1] "Electrolytic Metallizing on Non-Metallic Surfaces," by Elias Schore, *Metal Finishing*, August, 1940, pp. 433-7.

METAL on various non-metallic bases. Upper left, glass; lower left, celluloid; center and upper right, acetate cast in rubber mold; lower right, hand carved wood. Courtesy Cohan-Epner Co.

Metals

Complete data on the preparation and plating of plastics, plaster, wood, leather and many other non-metallic materials

TRANSPORTATION

Airline accessories, dashboard fittings, electrical equipment, escutcheon plates, handles, instrument parts, knobs, molded parts.

RADIO

Antennae, cabinets, coils, condensers, dials, grilles, knobs, shields.

MISCELLANEOUS

Bottle closures, boxes, dental plates, hardware, musical instruments, plastic sheets, statues.

It is safe to say that any of these articles can be finished in any metal, but it is equally important to note that the finish can be successfully applied only by the great care and skill of the experienced "metallizer."

Coated Plastics

The advent of plastics gave rise to even more than the usual crop of predictions for new developments. Plastics were the last word in beauty and utility; plastics were light and strong; plastics would replace metal, wood and all other solid substances. And as usual with new developments, plastics have found their place—a very important place to be sure—but still just a place, in industry. Instead of driving out metals and metal finishes, they have called them in to add to and supplement their own qualities.

For that reason, there are endless combinations of assembled metals and plastics, plastics coated with metals.

Briefly, some of the advantages to be obtained by the use of metal finishes on plastics are as follows:

(1) Plastics may be plated with a non-porous film of metal to prevent moisture absorption.

(2) Plastics may be plated with the most suitable metal to protect them from corrosion such as alkalies, solvents, etc.

(3) Great sales appeal is added by the use of combinations of plastics with bright and satin finished metal, chromium, gold, silver, etc. Inexpensive, plain or colored base materials may be given the appearance of expensive jewelry and novelty items by covering them wholly or in part, to special designs.

(4) Plastics coated with metals may be used for electrical conductors, to carry current, or to act as shield or condenser.

(5) Electroplating with a hard metal surface such as chromium provides a surface with a longer life, resistant to friction and wear.

(6) Plastic with a metal coating provides a product with the appearance of metal and the light weight of the plastic.

General Methods

In general the following methods are available for applying metal to a non-metallic base:

(1) A binder and conducting coat combination; the best known and most used form of metallizing.

(2) Sprayed metal.

(3) Cathode sputtering.

(4) Evaporated metal or vacuum deposition.

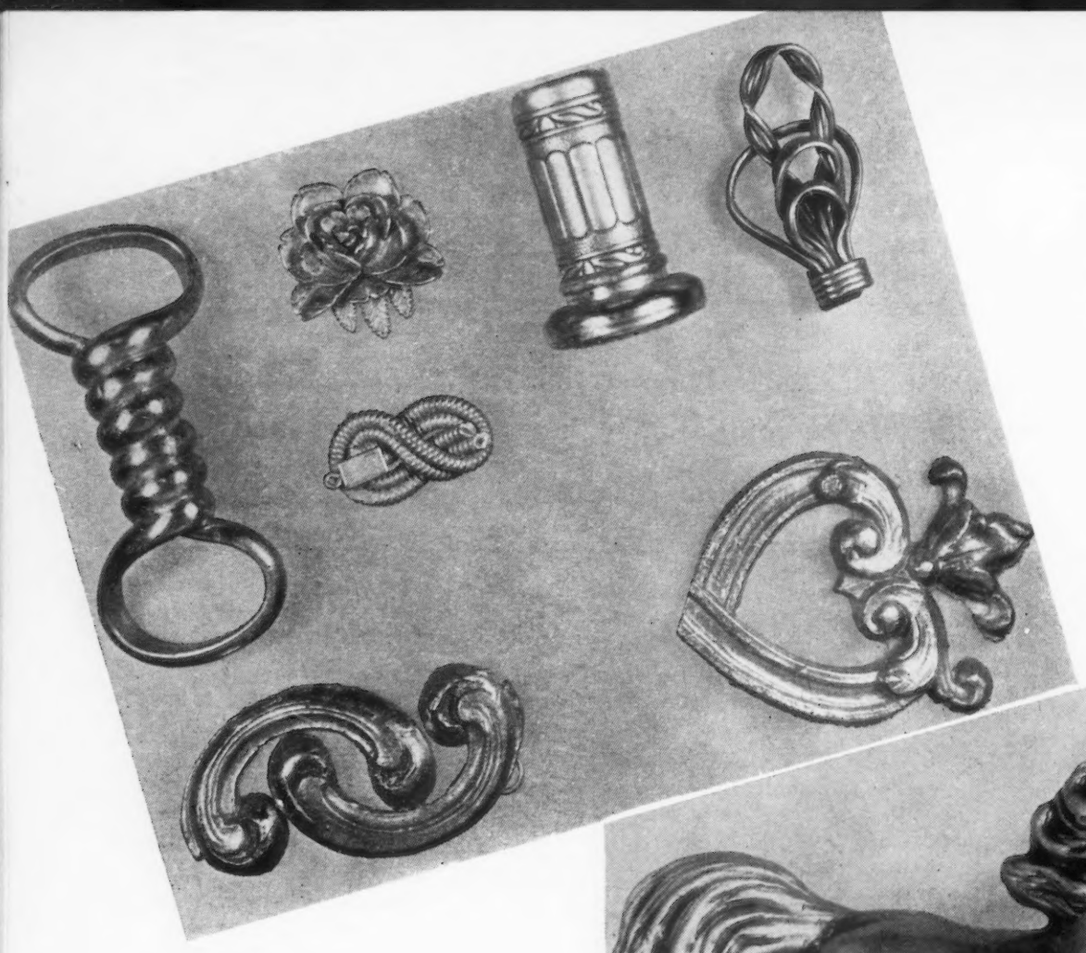
(5) Silvering by chemical reduction or precipitation.

The binder and conducting coat combination is probably the most generally used; it is certainly the oldest. It has very definite advantages: flexibility, applicability to a wide range of products and materials, the use of little if any special, expensive equipment. In some forms, however, it does have certain disadvantages. Its deposit is non-uniform, as the final electrodeposit is heaviest on those points of the surface where the bronze powder, for example, is thickest. Also, a bronze powder mixed with varnish is only partially conductive as the metal is dispersed in the non-conducting varnish. This is not important in the case of irregular objects such as babies' shoes but interferes where fine delineation or registry is important. Another fault is its tendency toward an orange peel effect.

The silver conducting coat eliminates some of these disadvantages, but it is fragile and calls for special care in handling.

Metal spraying is a comparatively simple process, calling for the thorough cleaning of the work, roughening the surface by a sand blast to provide proper anchorage and then application of molten metal, which is fed in wire form (or powder) to a heated air gun in which it is atomized and sprayed on the work. This method has limitations, being most generally applicable to structural installations

THIRTY-THIRD in a Series of Articles on the Technical and Economic Aspects of Metal Cleaning and Finishing



LEFT

METALLIZED novelties. Five items above are celluloid; two below are pressed or plastic wood. Courtesy Cohan-Epner Co.

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BELOW

METALLIZED terra cotta. Courtesy Cohan-Epner Co.

for protection against weathering and other deteriorating influences; but it can also be used on small work where the granular effect of the sprayed metal surface is not objectionable. It is capable of being applied by high production methods over large areas, but partly because of the appearance of the deposit and partly because of the cost of the equipment it is not widely used for small decorative work.

Cathode sputtering is a very expensive but very fine process for depositing metals. The work is placed in a vacuum tight chamber or vessel, such as a bell jar, fitted on a heavy ground glass plate. A relatively high voltage (10,000) is applied between an anode and the metal coating material, which is the cathode, in a partial vacuum, approximately 0.001 mm. pressure. A glow discharge is induced, causing the disintegration of the cathode, from which the removed metal is deposited in the form of a thin film on the work which is placed between the anode and the cathode. The three phases of this process are:

(1) Generation of the metal gas.
(2) Transportation of the gas.
(3) Condensation of the gas as a metal film.

The metallic deposit is very fine-grained and crystalline in character. The porosity of the deposit decreases with the thickness of the coating.

The most important commercial uses for this process are the preparation of fine mirrors, the metallization of fabrics, deposition on acetate phonograph recording disks, and silver on surgical gauze for the treatment of wounds.

Metal vapor has also been deposited by thermal means. The metal is heated to evaporation in a very high vacuum (0.00001 mm. pressure) in a magnesia, alumina or graphite crucible, or by coating a tungsten resistance wire. Obviously the high vacuum required limits the commercial use of this process, it does hold some promise for special applications, such as for optical mirrors, etc.

The silvering process is also old and although its largest field lies in the manufacture of mirrors, it is also used in combination with other conducting materials for depositing heavy coats on all types of conductors. In principle, the process consists of the precipitation of a thin film of silver on a clean surface, by reducing the metal from one of its compounds by the addition of another chemical. For example, the mixing of ammoniacal silver nitrate with formaldehyde results in the deposition of metallic silver. In one process this mixing is done by means of a spray in which a jet of silver solution and a jet of formaldehyde meet very close to the object to be silvered, mingle thoroughly and as they strike the object, leave a thin silver deposit on it. (They may also be mixed in a chamber before applying.) The de-

posit is then washed and copper plated to any desired thickness.

Metallizing Methods

Although, as stated above, the great volume of metal coating on non-metallics is done for utility, an endless variety of articles are coated mainly for decoration and in many instances for preservation (such as babies' shoes). The fact is, to the public mind, metallizing is a process for use on jewelry, novelties, gift-ware and the like. It is this class of work which is described in detail in the following paragraphs.

Simple as the fundamentals of metallizing are, many methods and materials are in use. Few subjects have evoked more controversy; each plater has his pet shop kinks which he declares upon oath, are absolutely indispensable to good work. Following, therefore, are descriptions of several of the recommended methods now in commercial practice in one place or another.

The process of coating non-metallic substances with metal by electrodeposition calls for: (1) the application of a bonding coat; (2) an electrically conductive film; (3) electrodeposition of copper to the desired thickness; after which any other plate or finish may be applied. The general plan of this treatment is the same for any article, but the details vary with the type of material to be coated.

For practical purposes, products to be metallized may be divided into two classes: (1) those with porous surfaces, and (2) those with non-porous surfaces. The porous surfaces include such materials as plaster of paris, wood, papier mache, etc.; the non-porous—glass, porcelain, compositions, plastics, etc.

Preparing Porous Articles

On porous articles, the first operation necessary is a treatment to make the surface proof against liquid penetration. This operation may consist of placing the products in a mixture of one part beeswax, three parts paraffin and one part resin, at about 200 deg. F. The work is kept in this mixture for 20 to 30 min., then removed and allowed to cool. The time for removal is indicated by the cessation of bubbling. Another filler material is ceresin wax, to be used at 150 deg. to 160 deg. F.

Wax is used generally where adhesion is not an important prerequisite of the finished article, as in models for molds; also for porous but stiff articles which will resist deformation. Otherwise, shellac or lacquer are often used as fillers.

Bonding Coats

In all cases, however, where some degree of adherence is required, either shellac or lacquer is used as the bonding coat to provide adhesion between the basis material and the following electrically conductive coat. Of the two, shellac has the advantage of a higher solids content, filling in the pores of the work with fewer coats; also better adhesion to smooth surfaces.

It is more difficult to apply the conductive coat of bronzing powder to shellac, as the lacquer in which the bronzing powder is mixed, covers shellac badly if brushed on (although better if sprayed on). If the bronze powder is applied by a brush it should be preceded by a coat of boiled linseed oil which is allowed to dry overnight before brushing on the bronze. (The increased cost due to slower production by this method is, of course, obvious.) It is not uncommon to put a coat of regular lacquer on the linseed oil film to improve adherence by providing sufficient lacquer solids content which the bronzing lacquer alone does not have.

In some cases where the silver sulphide method (described later in this article) is used, shellac is generally employed as the bonding coat. On comparatively non-porous articles such as seashells, babies' shoes, rubber, etc., lacquer may be used to advantage as it is quick drying; also as noted above, if the bronze powder is applied by brush, the lacquer base is better.

A recommended shellac mixture is:[1]

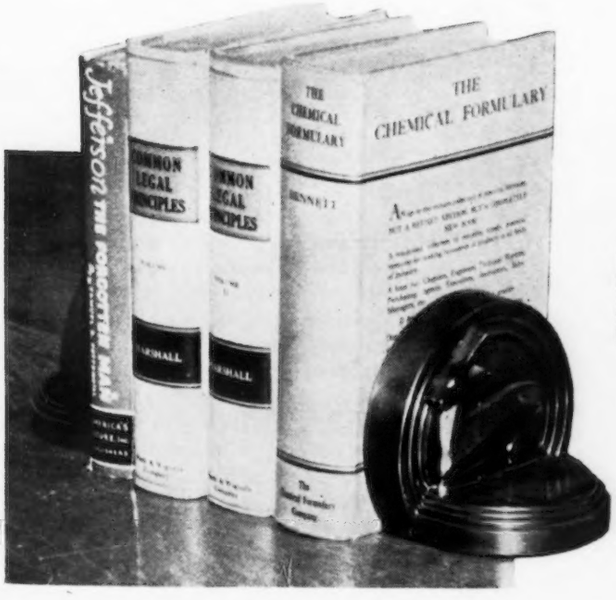
Denatured alcohol	1 gal.
Orange flake shellac	3½ lb.
Red lead	½ lb.

Another mixture consists of 6 oz. orange flake shellac in 1 qt. alcohol. Two coats of this shellac are generally required, and each coat must be dried in air for about 3 hr.

Work that has deep recesses and high projecting parts should have a coat of varnish, well brushed on and evenly applied. It is then set aside for about 1 hr., after which it has become tacky and ready for the conducting coat. A good varnish composition is:

Copal varnish	1 part
Turpentine	3 parts

Another material for painting the articles before metallizing is a thin solution of gutta percha in benzol which is allowed to dry. Two or three coats may be applied, depending upon the porosity of the work. While the last coat is still somewhat tacky, the bronze powder is applied with a soft brush or rubbed in with the fingers. It should coat the article with a uniform, smooth, dull coat. Lumpiness in the bronze powder indicates that the coating was still too tacky; a bright surface indicates insufficiency of the bronze powder. Imperfections in the surface can be repaired, however, by repeated ap-



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METALLIZED plaster book ends. Courtesy Philip Sievering, Inc.

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plications of the gutta percha solution.

Still another bonding mixture is a solution of one teaspoon of rubber cement in 2 qt. benzol.

Conducting Coats

Conducting films may be of graphite, copper bronze powder, silver or silver sulphide. Graphite is used principally for coating wax because of its affinity for greasy or waxy surfaces.

For example, a common mixture consists of 2 lb. electrotypers' graphite suspended in 1 gal. water. This combination sprayed, will give an adherent coat of graphite on the wax.

An effective graphite mixture is colloidal graphite suspended in water with some special material like Aquadag. A stock solution is made with 1 per cent gelatin and 0.01 per cent potassium dichromate. One part of this mixture together with one part of Aquadag and two parts of water gives the following combination:

Colloidal graphite	4.5 per cent
Gelatin	0.25 per cent
Potassium dichromate	0.0025 per cent

This can be applied with a soft brush, rubbed well into the pores of the product and allowed to dry, after which the article may be plated. Two or more coats of the graphite may be applied if desired.

Better results may be obtainable if the wax itself is mixed with about 5 per cent graphite.[2] A good example of a molding wax is 85 per cent beeswax, 10 per cent turpentine and 5 per cent graphite. The graphite coating may be improved by dusting iron filings over the surface and then following with a dip in a solution of 10 oz. per gal. of copper sulphate, which coats the graphite with a film of copper. The piece can then be plated in a regular acid copper solution. This procedure is generally used in electrotyping.

Probably the most commonly used material for sensitizing the surface of the general run of metallized articles is bronze powder suspended in lacquer; for example a mixture of:

Nitrocellulose lacquer	1 fluid oz.
Lacquer thinner	3 to 7 fluid oz.
Copper bronze or lining powder	2 fluid oz.

This formula is subject to considerable variation, depending upon the formulator. It is made by adding the bronze powder to the thinner, stirring thoroughly and then adding the lacquer.

The mixture should be made up only for immediate use since it jells on standing. The lacquer should contain less than 5 per cent gum and the copper powder must be free from grease. It is best to use the finest powder available as the quality of the article depends upon the smoothness of the coating, which in turn depends upon the quality and fineness of the copper or bronze powder. It may be applied with a camel's hair or badger hair brush, and the surplus powder washed off with clear running water.

Two coats of the bronze powder may be required. If they are applied by spray, the first coat should be allowed to dry for about an hour before applying the second coat. The second coat is permitted to dry for 2 or 3 hr., after which the work is ready to be plated.

In sprayed work an important part of shop practice is the handling of a gun. It must not be held too close to the surface of the work or the mixture will flood the article. Held at the proper distance, the conducting film will dry almost immediately after application, with a dull surface. A glossy coat is unsatisfactory as the gloss is caused by a top coat of lacquer which insulates the film against the current. Two coats of this mixture are usually enough for complete coverage after which the article may be dried for 1 to 2 hr. and then plated in the regular acid copper solution.

Work which is not deeply undercut may be first sprayed with a mixture of:

Tin powder	2 oz.
Bronze medium	1/2 pint
Bronze medium thinner	1/2 pint

The tin powder is useful in disclosing bare spots in the copper powder coat which follows. The parts are allowed to dry for 1 hr. and sprayed again, this time with a coat of:

Copper plating bronze powder	3 oz.
Bronze medium	1/2 pint
Bronze medium thinner	3/4 pint

The work is then dried in the air for 3 or 4 hr., after which it is ready for plating.

In some instances it is best to apply a silver deposit to the bronzed work before copper plating. This deposit can be obtained by a few seconds' immersion in a dip consisting of:

Sodium cyanide	3 1/2 oz.
Silver nitrate	3 oz.
Water	1 gal.

The solution should be clear, and, if not, can be cleared up by the addition of a little cyanide. There should be, however, as little as possible of free cyanide in the solution. No current is used in this strike.

Another silver solution is:

Silver nitrate	1 1/2 oz.
Distilled water	2 oz.
Ammonia	1 oz.
Grain alcohol	2 oz.

The work can then be rinsed and placed in the copper solution. The object of the silver dip is, (1) to check the completeness of the bronzing operation (as the silver will not deposit upon non-conductive surfaces and these spots, if any, will be instantly visible); (2) to provide a more highly conductive surface for the copper deposit. The points not coated by the silver can then be touched up with a little varnish and bronze powder, allowed to dry and then silvered.

The silver may also be applied by pouring the solution over the bronzed article.

Silver sulphide is often used as the conductive coating over shellac, the bonding coat. Silver nitrate may be added to the shellac before application or dispersed through the shellac by immersion of the shellacked work in a solution of silver nitrate in alcohol, to open the surface and permit the silver salt to penetrate it. The work is then dried and treated with fumes of hydrogen sulphide until the black film of silver sulphide is formed. Silver sulphide is a good current conductor and the work so coated can be rinsed and placed directly in the acid copper plating solution.

A mixture of silver nitrate in shellac may be made of:

Ethyl alcohol	1 pint
Silver nitrate	1 oz.
Shellac	4 oz.

This solution is to be used as a conducting coat, not a pore filler.

If it is preferable first to shellac the objects and then impregnate them with silver, a solution for immersing the shellacked work may be made of:

Ethyl alcohol	2 2/3 fluid oz.
Silver nitrate	1/4 oz.
Water	1 1/3 fluid oz.

Ed. Note:—Next week the author concludes with detailed data on silver coating for fine detail, and plating of plastics.

[2] "Plating on Non-Conductors," by G. B. Hogaboom, Jr., and Nathaniel Hall. *Plating and Finishing Guidebook*, 1940.

Automotive Material Substitutions

UP until the present, automobile manufacturers have been the largest consuming group of so many materials that are now on the restricted list that a disclosure of some of the specific steps being taken to redesign for substitute materials is of considerable interest. The accompanying article, abstracted from a paper presented before the summer meeting of the Society of Automotive Engineers, held June 1 to 6 at White Sulphur Springs, W. Va., is based on data compiled on a recent field survey made by Thomas A. Bissell, technical editor, *SAE Journal*. The major part of the paper deals with work done in replacing aluminum, nickel, nickel steels and zinc, all of which are critical materials, and also covers strategic metals like chromium, manganese, tin and antimony, besides some of the non-metals not included in this digest. In view of rapidly changing conditions, the situation pictured can be considered as being representative only of what was being done up to May 1.

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THE biggest redesign problem facing the automotive industry today is the substitution of other materials for the high grade aluminum alloy pistons that went into about 50 per cent of 1941 model passenger cars. One possibility is the use of low-grade aluminum alloys, containing at the most 87 per cent aluminum, all of which is melted from scrap. Aluminum suppliers point out that the government requires little of this material for defense requirements since it cannot be rolled or forged and the relatively small amount demanded is for miscellaneous die castings. Furthermore the tremendous increase in aluminum forgings and sheets is going to increase the amount of available scrap to the point where the supply of low-grade alloy may well exceed both defense and civilian requirements, unless means are found to use more low-grade alloys in place of the high-grade types now being specified for defense products.

The low-grade aluminum alloy is heavier than the alloys made of virgin metal and has a higher thermal expansion, requiring slight design modifications in making the substitution. Heat treatment is also different. Several successful designs of low grade aluminum alloy pistons have been worked out and will appear in some 1942 models.

Low-grade aluminum alloy also is being studied as a replacement material for brake wheel pistons heretofore extruded from high grade aluminum alloy. Powdered iron, cast iron, screw machine steel (high sulphur), welded steel forgings and a special glass were tried before one company obtained engineering approval on a low-grade aluminum alloy casting for this application. The powdered metal was found unsatisfactory without some form of plating or coating because the oil in the brake system formed a deposit caused by electrolytic action. The screw machine steel, welded steel forging and cast iron samples of brake wheel pistons also formed scale unless tin coated or chrome plated. Low-grade aluminum cast in permanent molds proved to be cheaper than the other alternates considered, since it did not have to be plated or coated. However, such castings proved more costly than the original high-grade extrusions because of greater machining required. The same company has also developed an injected molded plastic brake wheel piston as an optional alternate. A brake manufacturer is experimenting with coated or plated powdered iron and plastics for brake cylinders.

On the other hand, low-grade aluminum alloy cylinder heads employed originally on two 1941 models are being replaced with cast iron heads, necessitating a lowering of the compression ratio to suit the lower heat conductivity of the iron. Optional aluminum cylinder heads on other cars are being discontinued.

This brings us to a consideration of cast iron pistons, to which a great deal of study has been given in the event that even low-grade aluminum alloys will not be available to the motor manufacturers (more of a probability now than when Mr. Bissell prepared his paper a month or more ago). Cast iron pistons are approximately 50 per cent heavier, have less than half the thermal conductivity and about half the thermal expansion of aluminum alloy pistons. Increasing the reciprocating weight means that piston pins, connecting rods and bearings must be checked for strength, and the piston pin fit against lower expansion. Fortunate for the car mak-

ers was the adoption in many 1941 models of thin babbitt main and connecting rod bearings of greatly increased fatigue life, with ample capacity for the greater loads imposed by cast iron pistons.

On one line of cars, as soon as the present stock of parts is exhausted, a switch will be made to a connecting rod 5 per cent heavier and to bearings that incorporate a porous nickel bronze matrix to bond the thin babbitt lining to the steel backing, a type of bearing introduced into some 1941 models. Other companies, instead of using a heavier connecting rod, plan to use a stronger steel, changing from SAE 1045 to SAE 1340, when the switch is made to cast iron pistons.

Whether or not aluminum-alloy pistons will ever have to be replaced by those of cast iron depends upon future availability of low-grade aluminum alloy. At the time that the original paper was prepared, low-grade aluminum alloy had a B-4 priority rating which allowed passenger car manufacturers 90 per cent of their 1940 requirements on aluminum pistons.

Since production of cast iron pistons requires different and more extensive machining and grinding operations, a complete new machine tool set-up is required. To insure against a possible future shutdown of automobile production because of curtailment of piston aluminum, many manufacturers already have production equipment for cast iron pistons set up and ready. One corporation already has spent about $750,000 in *getting ready* to replace aluminum alloy pistons with those of cast iron.

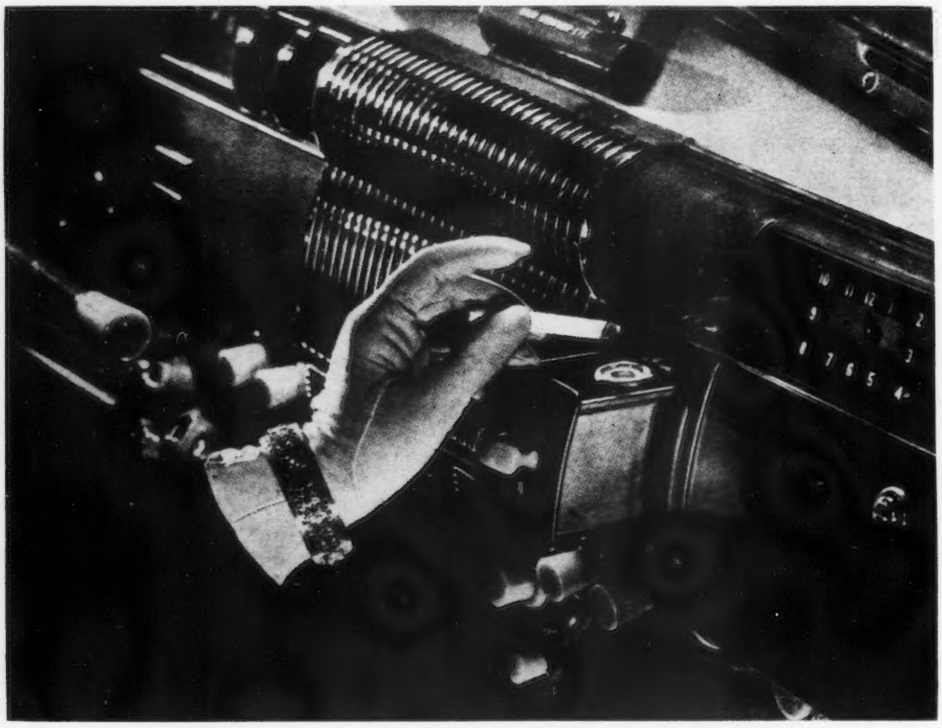
Following are other typical aluminum-alloy parts with the alternates which have been approved to replace them: Engine front-end oil seal — plastic alternate; timing gears—plastic gears with steel center; valve chamber cover—cast iron substitute; distributor body—cast iron alternate; sheet aluminum horn resonator disks—sheet steel; aluminum foil in electrical system —tin foil.

Eliminating Nickel

Work being done to eliminate or minimize the amount of nickel used in passenger cars, in general, consists of substituting non-nickel steel alloys for those of nickel; taking out the nickel used in certain cast irons; eliminating or reducing the amount of nickel used in chrome plating; and dispensing with the plating entirely. Several companies report that 80 per cent or more of the nickel will be eliminated from their cars. Replacing the nickel steel alloys is proving the biggest job because of the modifications necessary in machining and heat-treating, and sometimes in the design of the part itself.

Nickel alloy steels were adopted originally for the transmission gears, rear-axle gears, and many other parts of the power-transmission system and steering system in many cars because of their toughness, hardness, and resistance to shock. Recent trends in design of the power-transmission system, however, have all been in the direction of eliminating jerks or shocks. For this reason, a trend toward replacing the nickel alloy steels with those of carbon - molybdenum, chrome - molybdenum, manganese-molybdenum, carbon-manganese, or high-tensile low-alloy steels and variations of these, started some time ago, so that some cars today have few nickel steel parts left. Other cars have retained many of the nickel steel alloys, the nickel in which amounts to from 1 to 2 lb. per car. These companies explain that the nickel steels were retained more for their production economy than because of their extra shock resistance and hardness.

Following is the steel substitution program for one line of passenger cars which is shifting from SAE 3100 series nickel-chromium steels and SAE 4600 series molybdenum-nickel steels to SAE 4100



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THE Nash automobile fitted with an instrument panel of Tenite II (cellulose acetate-butyrate).

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series chrome-molybdenum steels, SAE 1300 series manganese steels, and SAE 5100 series chromium steels:

Name of Part	Nickel Steel SAE	Substitute Steel SAE
Axle shafts (semi-floating type)	X-3150-A	4150
Pitman arm studs	3135-A	1340 & 4140
Steering arm ball studs	3115-A	4115
Front axle king-pins	3115-A	4115
Steering knuckles	3135-A or X-3140-A	4140
Steering knuckle support	3145-A or X-3140-A	4140
Axle shaft bolts (full-floating)	3140-A	4140
Differential pinion shafts	3115-A	4115
Differential side gears	3130-A	5130
Rear axle ring gear and pinions	4615-A	C-4120
Universal joint yoke trunnions	3115-A	4115
Differential pinion spiders	4615-A	4115
Differential lock screw	3135-A	4140
Propeller shaft couplings	3135-A	5145

Nickel steel substitution programs of some other companies retain the SAE 4600 nickel-molybdenum steels (1.65 to 2.00 per cent nickel) for gears but eliminate all other nickel steels, substituting SAE 4100 chrome - molybdenum steels for SAE 2300 nickel steels and SAE 5100 chromium steels for SAE 3100 nickel-chromium steels. In addition, many companies are experimenting with so-called low alloy, high tensile steels that contain small amounts of almost all the best-known alloying elements. These steels are reported to have good machinability and hardenability. Consequently, the possibilities of getting as good finish at high machine speeds as, for example, with nickel-molybdenum SAE 4600 steels, are being explored. One company has tested and approved SAE 1320 manganese steel for the rear axle gears and SAE 4140 chrome-molybdenum steel or low alloy, high tensile steel for connecting-rod bolts so that the substitution can be made quickly if necessary.

Corrosion and heat resistant steels containing about 18 per cent chromium and 8 per cent nickel have been used on many lines of passenger cars for exterior moldings and trim. All these steels are being eliminated. In their place some companies are substituting corrosion resistant steels containing about 18 per cent chromium; others are replacing them with carbon steel chrome-plated; and still others are giving serious thought to eliminating almost all the moldings and trim. For small moldings, substitution of plated copper is contemplated on a number of lines.

Valve Steels

Chrome-nickel exhaust valves (containing from 1½ to 12 per cent nickel) are used in a majority of passenger cars. Many engineers are of the opinion that if they were permitted to have nickel steel alloys in only one part, they would retain them in the exhaust valves. The reason is that the combination of nickel and chromium shows the greatest resistance to the excessive heat and oxidizing and corroding influence of the exhaust gases. Exhaust valves with little or no nickel but containing 7 to 18 per cent chromium and 2 to 3½ per cent silicon are performing satisfactorily in many passenger cars, however.

Assuming that a substitution were required for exhaust valves of austenitic non-hardenable steel alloy containing up to 12 per cent nickel, one valve engineer indicates that he first would change to hardenable steel alloy containing 1½ per cent nickel, 18 to 20 per cent chromium, and 2 per cent silicon. If not permitted 1½ nickel, he would shift to a silicon-chromium alloy of 8 to 18 per cent chromium and 2 to 3½ per cent silicon.

Before the nickel limitations, most passenger cars employed inlet valves of SAE 3140 or similar nickel-chromium steels containing 1 to 1.5 per cent nickel. SAE 4140 chrome - molybdenum steel, SAE 5150 chromium steel, carbon-molybdenum steel, or even SAE 1050 carbon steel can be substituted to give equivalent performance. Such changes are being made in many companies.

Many of the roller bearings used in passenger cars are made of case-hardening SAE 4600 molybdenum-nickel steels. Substitution in this case is unlikely for two compelling reasons: (1) More than half the production of roller bearing companies is now utilized in defense equipment and (2) change to a non-nickel steel alloy would necessitate changes in physical properties, tolerances, and so on, large enough to require extensive retooling and revision of engineering standards now in wide usage. Such changes would require machine tools, dies, die makers, and skilled machinists urgently needed for defense.

Nickel in Castings

Of recent years the practice has been to add nickel in small quantities from 0.25 to 1.25 per cent to the cast iron and cast steel alloys used in cylinder blocks, cylinder heads, and pistons to toughen and harden the iron, thus permitting thinner, stronger sections of uniform hardness. If necessary this nickel can be taken out, metallurgists report, and virtually the same properties obtained by increasing the silicon content or by substituting other non-nickel alloying combinations. In cast crankshafts and camshafts also, the work formerly done by a small amount of nickel in the alloy could be done by adding copper.

Nickel Plate

Before the shortage in nickel, passenger cars had as much as 3.6 lb. of nickel in their plating, between 1½ and 2 lb. being an average amount. Through recent developments, this amount will be reduced so that the average car will have only about ½ lb. of nickel in the plating. In one line of cars the nickel thickness has been reduced from 0.0007 in. to 0.0002 in., made possible by using bright copper, which is three or more times thicker than the dull copper used previously, in conjunction with a special bright nickel. The bright nickel over the bright copper produces a practically flawless surface with high gloss so that the buffing operation formerly required before applying the final chrome coat, can be eliminated. Most passenger-car companies are planning to use this new plating in 1942 models when the extensive changes in equipment required are expected to be completed.

Chromium has been successfully plated directly over a heavy plate of copper for interior trim parts, but the elimination of the intervening nickel plate is not possible for exterior trim. Tests made in Germany indicate that the copper underplate will bleed through in the form of a bronze stain when the chromium plated object is exposed to rain.

For fear that nickel or nickel salts for plating may be cut off entirely, one company is experimenting with indium as a substitute. This material is now very expensive, but its price is reported to be

dropping. It also requires heat treatment and buffing. Cadmium is suggested as another substitute, but such plating would lose much of the former brightness. Silver is mentioned as another possibility.

The consensus of opinion seems to be, however, that exterior plating will be eliminated if nickel for this purpose is cut off. Surfaces now plated would be painted. One large company is now seriously considering elimination of plating regardless of whether or not nickel is available for plating. Such a trend might not be so undesirable in the opinion of some engineers since there would be no large areas of glittering metal to divert attention from the graceful lines of modern motor cars.

Taking Out Zinc

Although preliminary estimates state that about 50 per cent of the zinc formerly employed will be taken out of the 1942 passenger cars, engineers have been studying substitutes for the literally hundreds of die castings used in modern cars in preparation for a possible complete shut-off of zinc supplies. According to recent estimates, however, many passenger car engineers are prepared to remove more than 80 per cent of the former zinc weight from their 1942 models.

Zinc-alloy die castings that serve merely to decorate the car should logically be the first to go, and this has been the policy pursued by all makers. The hope is that these savings will be great enough to permit retention of zinc-alloy die castings for important functional parts. Elimination of zinc die castings for radiator grilles makes by far the greatest single weight saving. Weighing as much as 30 lb. apiece, their substitution lops a big chunk off the total weight of zinc die castings, which has run over 80 lb. in some models.

Plated stamped steel or antimonial-lead die casting alternates will appear on virtually all 1942 models. Tooling costs and car production have been an important factor in the choice between steel stampings and antimonial-lead die castings as radiator grille substitutes. The dies necessary for stamping steel radiator grilles cost from $100,000 to $300,000, whereas dies for die-casting these grilles cost only about one-tenth as much—from $10,000 to $20,000. The per-car cost of this change can be excessive unless it can be distributed among a great many cars. On the other hand, the steel used for stamping a radiator grille costs only about one-fifth as much as the zinc alloy necessary to die-cast the same grille.

Antimonial-lead die castings cost about 25 per cent more per part than zinc-alloy die castings. The former costs about 25 per cent less per pound but has a specific weight more than 50 per cent higher. Although its tensile strength is only about one-third that of zinc alloy, its strength is adequate for the unstressed decorative parts for which it is to be used. Furthermore, antimonial-lead die castings can be made with steel reinforcements in them in parts where additional strength is required. An important advantage of their use is that the antimonial-lead die castings can be made from the same dies used previously for zinc. Antimonial-lead is difficult to polish, however.

A number of alternates are being considered to replace zinc-alloy die castings in interior hardware and outer door handles. Plastics reinforced with spring steel and cast-iron bushings have been approved as optional on a number of lines. Plated plastics are also being considered for these parts. These plastics are plated by spraying them with metallic bronze and then adding chrome plate. Plated or painted cast iron is also being considered as an alternate for these parts. A large decorative die casting that is being universally replaced by a plated steel stamping or plastic is the instrument-board grille which as a die casting weighs as much as 2¾ lb.

These replacements of decorative parts are comparatively easy to effect when compared with making those for important functional parts now produced as intricate zinc-alloy die castings. Carburetors and fuel pumps are examples of these critical designs. Companies producing them have developed, but not put into production, carburetors and fuel pumps in which all but a few small zinc-alloy parts have been replaced by those of cast iron. Stems and needles, now of brass, can be replaced by plated steel stampings or cold-rolled steel. One company estimates that cast iron alternate carburetors and fuel pumps will cost 25 per cent more on an emergency basis than those of zinc alloy, the difference being explained in the greater tooling and machining cost, and in the higher scrap loss because of blowholes and core shifts. Other companies have developed carburetors and fuel pump covers of steel stampings with brazed-in fittings.

Plastic Alternates

Considerable work is being done by a number of companies on the development of plastic alternates for zinc-alloy die castings. Some believe that plastics ultimately can be released to replace 90 per cent of existing zinc-alloy die-cast parts. Plastic alternates have many advantages over those of cast iron. For example, the die-casting molds often can be adapted to handle the plastics, and the tooling and machining usually required is negligible by comparison.

Although there is general agreement as to the suitability of plastics for decorative parts, their adequacy for important and intricate functional parts such as carburetors and fuel-pump bodies is questioned by some authorities because, compared with zinc-alloy die castings, plastics are less stable dimensionally; holes cannot be cored as deep or as close; their impact strength is less than that of zinc; and production rates will be lower, even with injection molding of thermosetting plastics using accelerators to increase the rate of cure, unless expensive multiple-cavity molds are resorted to. Furthermore, if used for carburetors or fuel pumps, plastics must withstand high engine temperatures, zero atmospheric temperatures, and engine vibration. Another difficulty to be overcome is the solvent action of the fuel, especially benzol fuel, on certain plastics.

Since automobile brass contains about 30 per cent of zinc, alternate materials are being worked out for parts made of this material. In this respect the most important changes are being effected in the radiator, where brass water tubes and upper and lower tanks are almost universally being changed to copper because of a growing scarcity of brass sheet. Terne-plated steel or steel coated with special corrosion-resistant paint also could be used for these parts if copper gets scarce.

An aluminum-plated glass substitute is now ready to replace the silver-plated brass reflectors on the composite units of sealed-beam headlights. Stamped and plated steel hub caps will replace those of brass that were spun over, in many

cases eliminating the necessity for zinc-coating the inside surface.

Not so long ago long trumpet-type horns were used generally in passenger cars. Although satisfactory in performance, they were replaced by spiral snail-shaped horns made of zinc-alloy die castings, mostly because of space saving. In the present emergency, therefore, most manufacturers are planning to go back to the old trumpet-type stamped-steel horn.

To give a more complete picture of the work being done, the following list of approved alternate materials is given in the table.

Zinc-Alloy Part	Alternate Materials Approved
Speedometer gears	Plastic
Speedometer pinion sleeve	Cast iron
Defroster funnel	Steel stamping
Steering-wheel hub and brackets	Steel stamping or malleable casting
Horn button	Plastic
Horn ring	Steel stamping, plated and welded
License bracket	Cold-rolled steel
Shock absorber guide	Cast iron
Transmission cover	Cast iron or plastic with steel reinforcement
Transmission shift levers	Machined steel forgings
Medallions	Back-painted, injection-molded transparent plastic
Door lower channel roller assembly	Steel
Outside mirror assembly	Steel
Rear window light frame (convertible)	Pressed steel
Lock switch housing	Cast iron or antimonial lead
Directional light switch housing	Plastic and steel stamping

Chromium

Although mandatory priorities had not been invoked on chromium when the original paper was prepared, material substitution programs have taken into account the possibility of a tightening of the supply of this material, most of which is imported from Turkey, Africa, and other foreign lands. The greatest amount of chromium used in passenger cars is in alloy steels. Exhaust valves would be definitely critical in event of a chromium famine as valve engineers cannot conceive of a satisfactory production exhaust valve alloy containing neither nickel nor chromium. Virtually all ball bearings and many roller bearings employ through-hardening chromium steels—usually SAE 51200, or modifications thereof. These parts are also critical because most of the output of ball and roller bearing manufacturers is now going for defense equipment and any change in steel would require revolutionary revisions in production processes, tolerances, and engineering standards.

Shut-off of chrome and chrome-molybdenum alloy steels for gears, transmission parts, and steering assemblies would cause difficult but not insurmountable problems of substitution if nickel also were not available, according to some metallurgists. If manganese, molybdenum, vanadium, zirconium, and silicon were still available, they believe satisfactory alternates could be worked out, although more generous sections might be required to compensate for possible deficiencies in impact strength. Metallurgists of one company contend that carbon-molybdenum steels could be substituted throughout the entire car with exception of the exhaust valves and roller and ball bearings. Small amounts of chromium are used in many cast irons for such parts as cylinder blocks, pistons, and cylinder heads. These could be replaced by other available alloying elements to give cast irons and cast alloys of virtually the same properties, it is reported.

The small amount of chromium used in so-called chrome plating is amazing—only about 0.36 oz. per average car, although about the same amount is wasted in production and application. The reason is that the coating of chrome is only 0.000015 in. thick in many cases. For this reason it is logical to conclude that chrome plating is much more likely to be abandoned because of a shortage of nickel or copper, than of the insignificant amount of chrome employed. It is safe to predict, however, that chrome plating will be eliminated from passenger cars if the supply of either copper, nickel, or chromium is cut off.

Tin

Tin, another strategic material, is used in passenger cars in babbitt bearings, bronze bushings, coatings for pistons and other parts, radiator solders, body solders, terne plate for mufflers and gaskets, and tin foil. So thin have the babbitt linings of the main, connecting-rod, and camshaft bearings become (about 0.003 in.) in the average car today that only about ½ lb. of babbitt is required. The tin in this babbitt ranges from 0.45 to 0.045 lb. per car, depending upon the type of babbitt used. Although the bearings of many cars recently have been shifted from tin-base babbitt to the less costly lead-base babbitt, tin-base babbitts are still widely used. In the event of tin shortages, bearing authorities recommend a substitution program in the following steps, depending upon the amount of tin available for bearings:

1. Replace all tin-base babbitts containing 90 per cent tin with SAE 14 lead-base babbitts containing 10 per cent.

2. Replace SAE 14 lead-base babbitts containing 10 per cent tin with SAE 13 lead-base babbitts containing 5 per cent tin.

3. If impossible to get the 0.045 lb. of tin per car required for SAE 13 babbitt, go to a cadmium-silver-copper bearing alloy with indium added to inhibit the tendency of the oil to corrode these bearings. As the cost of such bearing linings would be excessive, they would be employed only under emergency conditions.

The tin used in bronze piston-pin bushings amounts to from 4 to 10 per cent. Suggested alternates for this material include aluminum bronzes that contain as little as ½ per cent tin. Bronze bearings and bushings are being replaced by powdered metal or molded plastics.

Protective tin coatings are used on a majority of passenger-car engine pistons today, whether they are of aluminum or cast iron. Tin is very effective in the prevention of scuffing during the break-in period because tin itself is a lubricant. Nonetheless, tried and proved alternates are available in event of a tin shortage. For aluminum-alloy pistons, if such are still in use, anodizing will be substituted. For cast iron pistons, an insoluble phosphate coating is planned. This coating is reported to be crystalline in character and to absorb and hold oil.

About 4½ lb. of radiator solder per car are now employed to build

(CONTINUED ON PAGE 108)

Tips on Grinding Coolants

By H. J. WILLS
Engineer, The Carborundum Co.

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COOLANTS, as the term is used in grinding, obviously take their name from their principal use — to keep the work that is being ground from overheating. If that were their sole purpose, however, no coolant other than water would be needed, because its high specific heat makes it the most efficient cooling agent. Furthermore, it is the cheapest of all coolants. Still, it doesn't meet the full requirements. Why?

Here is a complete list of the qualities which, to be wholly satisfactory, a grinding coolant should have:

1—It should be an effective dissipator of heat. If work gets too hot, the surface may burn, resulting in so-called grinding checks. Even a degree of heat which is too slight to cause burning is apt to cause the work to expand and be distorted toward the wheel. This will cause uneven grinding and the work will be out-of-round, tapered or otherwise misshapen.

2—It must be of the proper viscosity, otherwise it will not be able to get where it must get in order to do its cooling job — that is, at the point of contact between wheel and work. In shop parlance this is called the coolant's ability to "wet out quickly."

3—The coolant should possess a low surface tension. It is this quality which enables it to precipitate chips and dirt readily, so that there will be less danger of their recirculating and damaging the surface of the work; also so that excessive filtering of the coolant will not be required.

4—Not only should a coolant not rust the machine or the work during the grinding operation, but it should contain some substance which will coat the work with a rust repellent or inhibitor which will not evaporate and so will protect the work when standing after grinding.

5—It should possess detergent qualities sufficient to keep the wheel face free from gumminess and the pores of the wheel free from metal chips. The extent to which a coolant has detergent properties determines to a considerable extent the ease with which the abrasive grains on the wheel face will penetrate the work. A clean wheel face cuts faster and removes more material, and lower pressures are required between wheel and work—which saves wear and tear on the grinding machine.

6—A coolant should be transparent enough to permit the operator to see the contact point of wheel and work while grinding. Opaque coolants are responsible for a lot of spoiled work.

7—A coolant should contain nothing that will damage the bond of the wheel that is being used. The bond of vitrified wheel is unaffected by any coolant, but rubber bonded wheels are harmed by the oil in some coolants, while resinoid, shellac and silicate bonds are likely to be seriously affected by alkaline coolants. This does not mean that such coolants cannot be used with any except vitrified wheels, but merely that the solutions should not be strong enough to damage the bond. That is, the coolant should be of a type which will give satisfactory results when used in dilute solution.

8—A coolant should be stable. It should not decompose or become rancid. This is primarily because such a condition is favorable to the growth of bacteria, which may result in the spread of an infection from man to man. To prevent this, it is well to add an antiseptic to the coolant, on the advice of the plant physician or the local health department.

9—Whatever coolant substance is to be added to water should mix with it readily, to save time and expense.

10—The coolant should not contain inflammable material.

11—If a coolant foams in the coolant tank or the grinding machine, it will leak and be wasted unless the foam breaks down quickly.

12—The coolant should be chosen with consideration to the finish and surface qualities it is desired to secure on the work. Thus one with strong detergent qualities, which keep the wheel face sharp, will result in a rougher finish than one which tends to clog or glaze the wheel face. In choosing a coolant, either the finish of the work or the speed of cut must be sacrificed to some extent.

The following list of commonly used coolants, their advantages and disadvantages, indicates how well each of them meets the above named requirements.

Plain Water

Advantages: Low cost, efficient heat absorber and dissipator; transparency gives good visibility of contact between wheel and work; low viscosity.

Disadvantages: Likely to rust work and grinding machine. Does not readily precipitate chips and dirt. Even when filtered, may contain grit. Much water is so "permanently" hard that when ordinary oils or pastes are combined with it, insoluble soaps are formed, which are deposited on the work and in the face of the wheel. Also, it may hold chips which will mar the work. Before using any water supply, have the water analyzed to determine what softening treatment is needed or which compound will combine best with it.

Water Containing Sal Soda In Solution

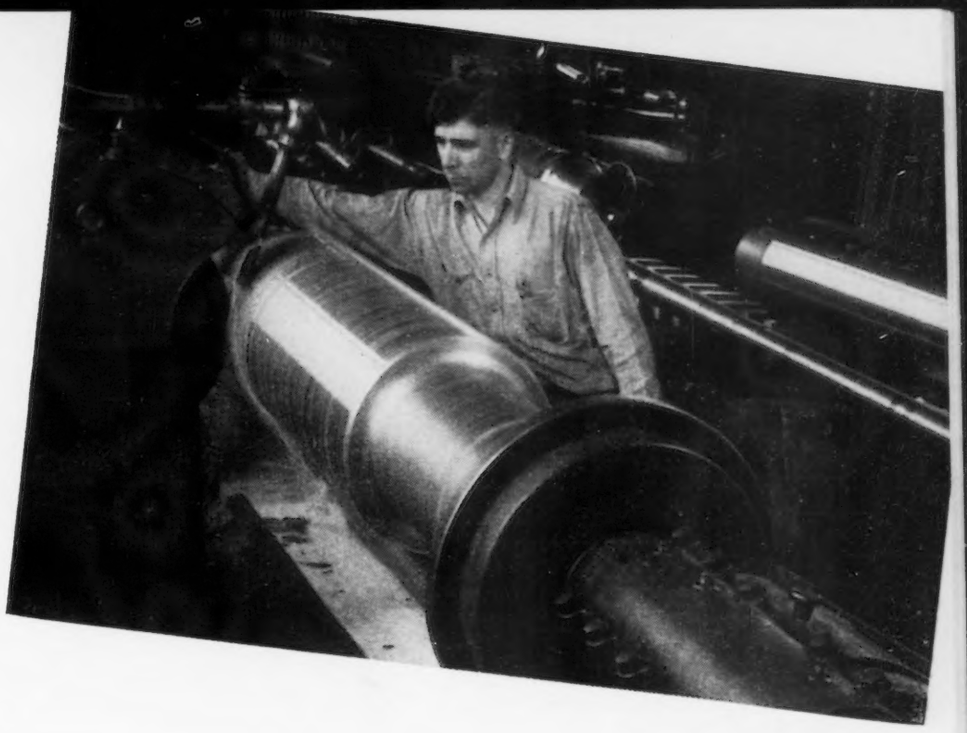
Advantages: Prevents rust to a degree. Good transparency. Good detergent qualities, which keeps the wheel face clean thus increases rate of cut, and saponifies and dissolves oil on the work thus preventing possibility of oil being transferred to wheel face. Precipitates foreign materials easily.

Disadvantages: May cause corrosion of work and machine. May damage wheels bonded with resinoids, shellac and rubber. May possibly harm operators' eyes and skin.

Soluble Oils

Types: soda base; potash base; sulphonated vegetable and animal

WHEREIN the author discusses the many factors that affect selection of coolants for grinding operations, taking into account the finish desired, rate of cutting, attack on the wheel bond, rust inhibiting properties, etc.



oils; petroleum base oils with no gummy material or excess acids.

Advantages: Easily soluble in water. Have good anti rust qualities which protect the machine and the work both during and after grinding. They give a reasonably high finish to the work.

Disadvantages: Most of these coolants are too opaque to permit good visibility of the point of contact between wheel and work. They are apt to leave gummy deposits on wheel face and machine. Have low capacity for absorbing and dissipating heat. They slow up cutting rate and require high wheel pressures against work. Tend to clog filters and to disintegrate rubber bonded wheels. May thicken when cold.

PASTE AND GREASE COMPOUNDS

Advantages: Same as for soluble oils above.

Disadvantages: Same as for soluble oils above. Also, to make a good emulsion with water, a great deal of mixing, using hot water, is required.

SOAPS

Advantages: Easy to mix with water. Have reasonably good detergent effects on wheel face. Give high finishes with only slight lowering of cutting rate.

Disadvantages: Foaming. Mechanical breakdown. Likely to become slimy and rancid. Tendency to carry dirt and chips back to work due to poor precipitation. Some high soap compounds have many of the advantages of the soaps without their more serious disadvantages.

MINERAL SEAL OILS, KEROSENE OIL, ETC.

Advantages: Chief use in grinding aluminum and other non-ferrous metals. Special oils of this type have been developed for use in thread grinding and honing operations.

Disadvantages: Clogging of wheel pores; fire hazard; bad effect on operators' skin. Low specific heat, hence poor absorber and dissipator of heat. May thicken when cold.

Miscellaneous Suggestions

It is always wise to have a good filter installed in the coolant system supplying any machine doing precision grinding. Unless chips and dirt are kept from returning with the coolant, the work will be scratched. Furthermore dirt and chips roughen up the face of the wheel to such an extent that the wheel must be redressed too frequently. With wheels as coarse as 60 grit, the number of pieces per dressing has been more than doubled by filtering the coolant. For high finish grinding on such products as gages, ball bearings, high finish rolls and the like, it is essential.

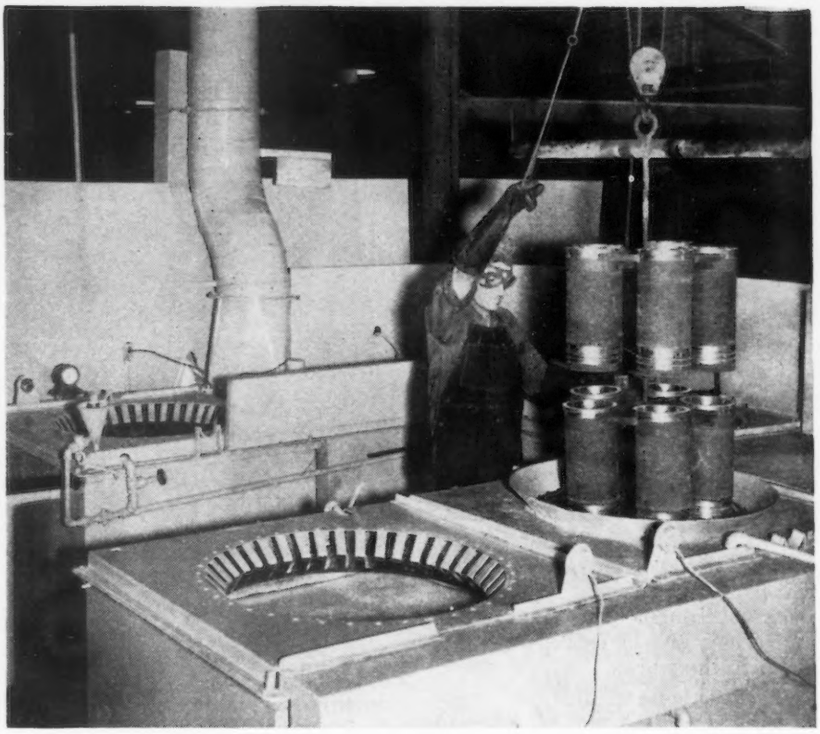
It is of vital importance to have a copious supply of coolant at sufficiently high pressure, at all times. Too small a flow is ineffective and sometimes even detrimental. This is particularly true of some surface grinders where the nozzle is so placed that the stream of coolant strikes the wheel only and is deflected down to the bed or the magnetic chuck, and only the moisture which adheres to the wheel—which is very little at surface speeds around 4500 f.p.m.—reaches the work surface. This causes the wheel to gum up quickly. Usually, surface grinding can be improved by moving the nozzle to one side where it can strike the work more directly.

It is bad practice to true or dress the wheel with a coolant and then grind dry, since the moisture which is retained on the face of the wheel tends to hold the cuttings and chips.

In wet grinding, it is equally bad practice to advance the wheel to the work without a supply of coolant at the time of contact. Some operators do this, especially when grinding large cylindrical pieces. They true or dress the wheel wet and then make momentary contact with the work without coolant in order to see when, and how much, contact is made. This procedure is most often done when an opaque coolant is being used. It is always best to have coolant flow at the time of contact, with the wheel traversing. If the contact cannot be seen, use a more transparent coolant.

In any kind of grinding, cylindrical or other, it is often difficult to get an adequate supply of coolant at the point of contact of wheel and work, due to the fact that a wheel traveling at 5000 f.p.m. or faster carries with it a dense atmosphere which the coolant has difficulty penetrating. The cure is to increase the coolant pressure, or to substitute a type of nozzle which will give a more concentrated stream.

Wear Resistant Coatings Produced by Etching



LOAD of 10 diesel engine cylinder liners about to be dipped in hot caustic for cleaning prior to being etched in a hot caustic sulphide solution. By precise control of time and temperatures as well as solution concentrations, an etched surface is produced on the bores that forms an effective break-in cushion under boundary conditions of lubrication.

RESEARCH first demonstrated and practice has since confirmed that etching of diesel engine cylinder liners in suitable agents will produce on the bore surface of the liner a type of nonmetallic, non abrasive coating that prevents metal-to-metal seizure under borderline conditions of lubrication. This process is now being used by the Caterpillar Tractor Co. to give protection to the liner surfaces during a diesel engine's breaking in period. The surface left is effective until the piston rings have formed the best possible seal with the walls of the liner.

When Caterpillar first began using this Surfide process, under license of the Standard Oil Co. of California which developed the technique, its diesel cylinder liners were made of alloy cast iron hardened throughout and tempered at about 700 deg. F. This alloy contained approximately 1½ per cent nickel and ½ per cent chromium. Subsequently, this alloy has been modified by lowering the nickel content and adding some molybdenum. Furthermore, the hardening process has been changed to high frequency hardening of the bore, using equipment developed by the Budd Induction Heating Co. This method hardens the surface to a depth of only about 0.065 to 0.090 in., and following tempering at 400 deg. gives a superficial hardness of 65-70 on the Rockwell 30N scale (435 to 500 Brinell).

The photograph shows the arrangement of baths for cleaning and etching. At present, the cleaning bath is a 1.4-1.6 per cent solution of trisodium phosphate, held at a minimum temperature of 180 deg. F. After immersion in the caustic cleaner for 3 to 5 min., the cylinder liners are immersed in rinse tanks for equal periods and at the same minimum temperature. Particular care is taken so that the third tank or second rinse is free of solids or other contamination. It is contemplated, however, that in the future this initial cleaning will be accomplished in a vapor degreaser. The fourth tank in which the work is immersed contains caustic sulphide of 48-50 per cent concentration by weight, and solution temperature of 250 ± 5 deg. An excess of sulphur is maintained so that there is approximately 1 per cent more than is necessary to combine with all the iron present in the bath. Immersion in this caustic etch is for 15 min.

The fifth and last tank is a rinse tank and is held at a minimum temperature of 180 deg. Rinsing is a matter of 1 to 3 min. for the purpose of removing the excess caustic sulphide. Thereafter the liners are given a light coating of a rust-preventive compound in the bore.

From such investigations as have been made in the laboratory, the coating produced on the liner is ferrous oxide and ferrous sulphide tightly adhered to the unetched under layer of iron. When the liners are finish honed, they show a surface roughness of 1½ to 3½ micro-inch. After etching, the surfaces show a surface roughness in the order of 9-11 micro inch. These figures would indicate that the order of service attack is extremely superficial, being less than a few hundred thousandths of an inch. In appearance, the etched surface is a black matte surface having practically no reflectivity. In fact, even the fine hone marks which may be seen on the cylinder barrel under oblique lighting conditions cannot be discerned after the etching treatment.

In a paper* presented on this subject of wear resistant coatings by J. E. Jackson, also of the Caterpillar Tractor Co., certain engineering aspects of the treatment were brought out. It is Mr. Jackson's contention that since honing subjects the bore surface to deformation through metal removal as well as through flow by scratching, it is conclusive that the honed bore is coated with a thin layer of work-hardened metal, with the grains in random distribution. Run-in or surface conditioning orients the surface grains in the direction of reciprocation, but just as the strain-hardened metal layer produced by run-in resists future wear, so does

* "Wear Resistant Coatings of Diesel Cylinder Liners," by J. E. Jackson, presented at the semi-annual meeting of the Society of Automotive Engineers, June, 1940, and published in the *SAE Journal*, January, 1941.

the strain hardened metal originally produced by honing tend to resist change of surface configuration by the run-in.

The methods by which chemical treatment makes the liner bore more susceptible to safe run-in are: By removal of the undesirable components of surface composition, by deposition of certain chemical end products, and by change in the surface configuration. When the layer of strain-hardened metal formed by honing is removed by etching, then the running in process is greatly facilitated for the reason mentioned above. The honing action is also likely to loosen or distort some of the polyhedral grains of the cast iron, and these are either loosened or distorted in the matrix but not removed. These loosened grains, which may later cause scuffing by action of the piston rings, are among those undesirable elements to be removed by chemical treatment. Removal of free ferrite is another factor since it is the free ferrite that is the principal cause of one ferrous surface seizing or welding on to another.

But while the treatment does remove free ferrite, it does not attack the graphite particles of the cast iron and therefore beneficial effects of graphite become immediately available as a lubricant. When free ferrite and small grains of pearlite are etched by the solution, on the other hand, pits are formed which will be partly filled by the sulphide-oxide end products. These pits serve as reservoirs for oil and the matte surface of the coating facilitates rapid spreading of the lubricating oil and retains it in the porous inner structure of the coating as well. And when the temperature of a small surface area is caused to increase rapidly through deformation, sulphur from decomposed ferrous sulphide adjacent to the hot surface area will aid the oil in preventing welding. The superficial sulphide-oxide coating is removed during run-in, but the pits remain in the surface much longer. Thus, the surface conditioned coating will experience wear—but at a very low rate. As a small amount of the surface is worn away, a new layer of wear-resisting coating is formed with the next stroke of the piston.

Bins Can Be Moved Quickly

THE accompanying photograph shows how steel bins can be moved to a new location without the time-taking trouble of dismantling and moving by individual sections. The bin pictured here is 30 ft. long by 10 ft. high. About 45 min. were used in moving such a unit 150 ft., involving about 8 man-hr.; about 80 man-hr. would be the time required for dismantling and moving by individual sections.

The equipment used is an inexpensive hydraulic jack (Blackhawk model J-14) such as is designed for lifting automobiles by their bumpers. Planks are bolted to both sides of the bin. Metal blocks are bolted above the planking to anchor the set-up when the hydraulic jacks are applied. Men are stationed along both sides of the shelving to operate the jacks, the toes of which force up against the planking. The entire load is lifted at one time. Planks with swivel casters are then rolled under the bins and the load is allowed to settle on the planks. When the shelving is spotted in its new location, the bumper jacks are again applied to raise the load so that the planks can be removed. The jack release valves are then slowly opened to drop the shelving to the floor.

Hydraulic Cylinders from Steel Tubing

VARIOUS products of Gar Wood Industries, Inc., Detroit, such as hoists and dump bodies for trucks and portions of scrapers employed for grading, are dependent upon hydraulic cylinders for their operation. These cylinders range from 5 to 10 in. in internal diameter and from 22 to 47 in. long. The cylinders proper are made from heavy-wall steel tubing of the welded seam type and require careful machining of internal diameters to insure good piston fits.

Cylinder bases are heavy steel castings which include oil passages and trunnions for mounting. Production starts with the machining of these castings in rather simple operations, one of which is to bore a recess into which one end of the tube is later inserted. The initial step in fabrication is to arc weld the tube to the casting. Welding is done in a fixture which holds the tube in a vertical position and rotates the assembly slowly as the weld is made.

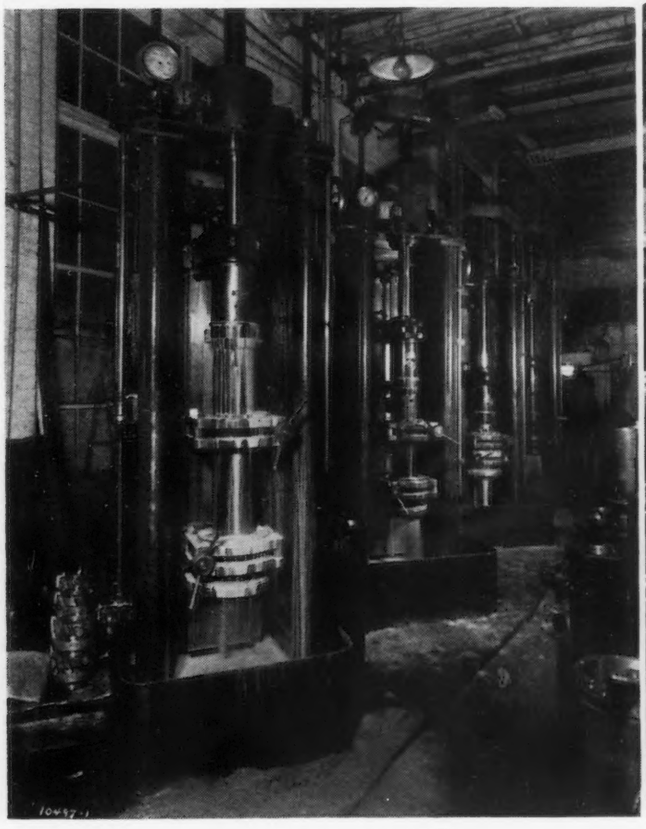
At the outer end, the tube is provided with a ring forging designed to receive the cylinder head through which the piston rod passes. This forging is also arc welded to the tube in an operation also accomplished in a rotating fixture. This makes the assembly ready for machining of the cylinder bore.

Boring is done in special machines designed for the purpose, partly because a rather long cut in reference to the diameter is required. A roughing and a finishing cut are made, using cutters with five blades of high-speed steel and removing in all about $\frac{1}{8}$ in. of metal. This boring requires, for the two cuts on a cylinder 47 in. long, about $1\frac{1}{2}$ hr.

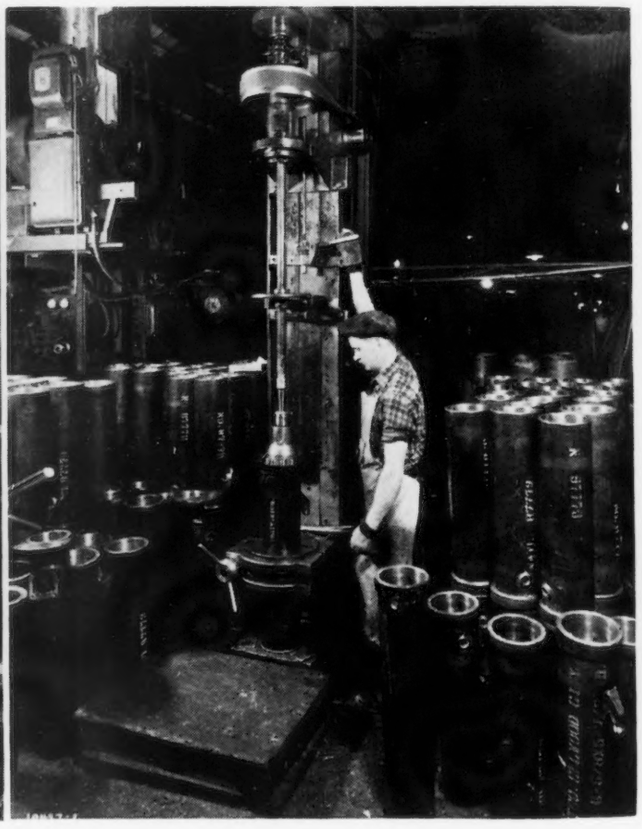
In the final operation, done on another machine of the same general type as that used for boring, the bore of the tube is burnished. The burnishing is accomplished by using a rotating tool the cage of which contains several barrel-shaped rollers of hardened steel arranged to rotate about their own axes as the tool is fed through the bore. This operation requires about 1 min. It results in enlarging the hole diameter by about 0.004 in. and at the same time gives the surface a very smooth finish. Marks left by tools in the prior machining are removed by the burnishing and there is a sufficient working of the metal to harden it considerably and thereby make the bore more resistant to wear in service. Burnishing completes the operations on the cylinders and they are then ready to receive the piston with its rod and the cylinder head.

Cylinders produced in this manner provide a sturdy assembly which, though moderate in cost, considering the heavy pressures which are applied and the quality of work required, have proved satisfactory and enduring in service.

SETUP for reaming the bore of cylinders on special machines designed for this purpose. Inserted blade cutters for the roughing and finishing cuts are shown at the left of the first machine.



SETUP for burnishing in which the tool, shown entering the work, has a series of barrel-shaped rollers of hardened steel, which are free to rotate about their own axes as the tool as a whole is rotated. The allowable variation in bore diameter is plus or minus 0.0015 in.



1500 TOOL STEELS

THIS is a continuation from last week of the indexing of approximately 1500 tool, metal cutting and die steels, and sintered carbides. In some instances the same steel is shown under several variations of the same name, in conformity with shop practice; the same steel is on occasion listed under a manufacturer's name and under a distributer's name; occasionally steels no longer made are indexed for the sake of full coverage; and, of course, some imported steels indexed are for the time being unobtainable. Thus, this indexing of all known tool steels should have maximum application in enabling users to locate and ascertain the properties of any steel produced in this country. This indexing of steels will be continued in successive issues of THE IRON AGE until completed.

M

Martin Steel
A non-deforming, air hardening steel, for machine parts, cams, and cutting, forming, drawing and trimming dies. Corrosion and abrasion resistant. Contains C 1.50, Cr 13.00, Ni 0.35, Mn 0.40, Co 1.20, Mo 1.20, Si 0.60. Detroit Alloy Steel Co., Detroit.

Marvel
A tungsten alloy hot work steel, containing W, Cr and V. Vanadium-Alloys Steel Co., Latrobe, Pa.

Master
A non-deforming steel, containing Mn. Duke Steel Co., Inc., New York.

Maxite
Super high speed steel for lathe and planer tools, turning locomotive tires, wheel boring. For heavy cuts and fast feeds. Contains C 0.75, Cr 4.00, Mn 0.25, Co 4.00, V 2.00, W 14.00, Mo 0.60, Si 0.25. Columbia Tool Steel Co., Chicago Heights, Ill.

Maxnap
A special alloy steel, containing Cr and V. Edgar Allen Steel Co., New York.

M Cr
A special alloy steel, containing Cr. Latrobe Electric Steel Co., Latrobe, Pa.

M Cr Mo
A special alloy steel, containing Cr and Mo. Latrobe Electric Steel Co., Latrobe, Pa.

Meteor
Oil hardening steel, for small taps, punches and dental burrs. Is deep hardening. Contains C 1.15, Cr 0.25, V 0.15, W 1.40. Firth-Sterling Steel Co., McKeesport, Pa.

Milo
Water hardening steel, for hand bull points, chisels, fire tools, flogging tools, shafting, etc. Contains C 0.35-0.45, Mn 1.00-1.10. Hidalgo Steel Co., New York.

Milo 35
Water hardening steel for pneumatic tools. Contains C 0.70-1.10. Hidalgo Steel Co., New York.

Milo 38
Water hardening steel for pneumatic tools, containing C 0.70-0.90. Hidalgo Steel Co., New York.

Milvan
A 19-4-2 high speed steel. Has high degree of hardness, excellent impact values and great compressive strength. For tools to be used for cutting and finishing hard materials. Contains Cr 4.00 to 4.25, V 2.25, W 19.00. A. Milne & Co., New York.

Mineor
Air hardening steel for short run dies, containing C 1.00-1.15, Cr 5.00, Mn 0.40-0.60, V 0.20, Mo 1.25, Si 0.30-0.40. Darwin & Milner, Inc., Cleveland.

Miner's Drill
A regular carbon steel. Jessop Steel Co., Washington, Pa.

Minerva
A special shock resisting chisel and punch steel, containing Cr. Edgar Allen Steel Co., New York.

MiRyCal Chisel
A special alloy steel, containing W, Cr and Mo. Ryer Incorporated, Ltd., Los Angeles.

Misco A
Standard water hardening tool steel, for track tools, chisels, etc. Contains C 0.80 to 0.85, Mn 0.25 to 0.30, Si 0.20 to 0.35. McInnes Steel Co., Corry, Pa.

Misco B
Regular water hardening tool steel, for mining and general tools. Contains C 0.70 to 0.80, Mn 0.30 to 0.35, Si 0.20 to 0.35. McInnes Steel Co., Corry, Pa.

Mix 819
A general purpose tool steel, containing C 1.00, Cr 0.50. Henry Disston & Sons, Inc., Philadelphia.

Mix 839
Drill steel, for metal cutting. Has resistance to abrasion. Contains C 1.10, Cr 0.30, V 0.20, W 1.15. Henry Disston & Sons, Inc., Philadelphia.

ML
An 18-4-2 high speed, air or oil hardening steel, for lathe, planer, boring tools, form tools, broaches, and roll tools. Holds keen edge, develops high hardness and resistance to wear. Contains C 0.80, Cr 4.00, V 2.00, W 18.00, Mo 0.75. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also, Edgcomb Steel Co., Philadelphia.

ML High Speed
A high speed steel, containing W, and V. Allegheny Ludlum Steel Corp., Pittsburgh.

Mo-Chip High Speed
High speed steel, for taps, punches and similar tools, containing carbon as required, Cr 4.00, Co 2.50, V 1.00, Mo 8.00. Firth-Sterling Steel Co., McKeesport, Pa.

Mo Cut
A molybdenum-tungsten high speed steel, general purpose, containing C 0.67-0.83, Cr 3.50-4.00, Mn 0.15-0.30, V 0.90-1.30, W 1.30-1.80, Mo 8.20-9.40, Si 0.20-0.35. Braeburn Alloy Steel Corp., Braeburn, Pa.

Mogul
A molybdenum-tungsten high speed steel used in place of 18-4-1 type. For broaches, circular saws, counterbores, hot and cold work dies, hobs, lathe tools, thread chasers, twist drills, etc. Contains carbon as desired, Cr 3.50 to 4.00, Mo 8.00 to 9.50, W 1.30 to 1.80, V 0.90 to 1.30. Jessop Steel Co., Washington, Pa.

Mohawk
High tungsten, hot-work, air or oil hardening steel for shear blades, punches, cut-offs, trimmer dies, hot work dies, etc. Good resistance to heat and abrasion. Resistance to shock less than Atlas A or B. Contains C 0.50, Cr 3.50, V 0.70, W 14.00. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also Edgcomb Steel Co., Philadelphia.

Moldie
A special alloy steel. Boyd-Wagner Co., Chicago.

Molel Alloy
A special alloy steel. Delaware Tool Steel Corp., Wilmington, Del.

Moly
A molybdenum high speed steel. Carpenter Steel Co., Reading, Pa.

Molyite (Molite MT)
Molybdenum-tungsten high speed steel for cutting tools where surface is removed after hardening. Contains C 0.80, Cr 4.00, Mn 0.30, V 2.00, Mo 9.00, Si 0.30. Columbia Tool Steel Co., Chicago Heights, Ill.

Mo-Max
This is a proprietary name owned and controlled by the Cleveland Twist Drill Co. and its only licensed use by others is on steel made and sold by licenses under patent No. 1,937,334. These steels are comparable to the tungsten type 18-4-1 high speed tool steels. Various trade names of the Mo-Max type are: LMW, Bethlehem HM, Mo-Cut, Star Max, Molite MT, Rex T-Mo, Di-Mol, Mogul, Tatmo, S. T. M., Mo-Tung, Vul-Mo, H-M Blue Chip.

Monaca
Water hardening steel for taps, dies, twist drills, dental and surgical

instruments, watch, speedometer and fine instrument parts, balance staffs, jewelers' and engravers' tools. Contains C 1.15 to 1.30, Cr 0.15 max., Mn 0.25 to 0.35, Si 0.15 to 0.25. Pittsburgh Tool Steel Wire Co., Monaca, Pa.

Monark
A special alloy steel. Canadian Atlas Steels, Ltd., Welland, Ont., Canada.

Motung (Mo-Tung)
High speed steels, for cutting tools. Has resistance to abrasion and heat. Contains C as desired, Cr 3.75, Mn 0.25, V 1.10, W 1.50, Mo 8.50, Si 0.30. Universal-Cyclops Steel Co., Bridgeville, Pa.

Motung 54
High speed steel, for cutting tools. Resistant to abrasion and heat. Contains C 0.80, Cr 4.00, Mn 0.25, V 1.60, W 5.00, Mo 4.00, Si 0.40. Universal-Cyclops Steel Co., Bridgeville, Pa.

Movan No. 2
High speed steel, for cutting tools. Has resistance to abrasion and heat. Contains C 0.85, Cr 4.00, Mn 0.25, V 2.20, Mo 8.50, Si 0.30. Universal-Cyclops Steel Co., Bridgeville, Pa.

M-T
A high speed steel, containing Mo, W, Cr and V. Universal-Cyclops Steel Co., Bridgeville, Pa.

Multole
A tough punch steel. Contains C 0.55, Mn 0.70, Si 2.0. Midvale Co., Nicetown, Philadelphia.

M. Y.
A special alloy steel, containing Cr. Houghton & Richards, Inc., Boston.

M. Y. Extra
A special alloy steel, containing Cr. Houghton & Richards, Inc., Boston.

Mc

McInnes Auto Die
Steel for automotive dies and tools. Contains C 0.80 to 0.90, Mn 0.30 to 0.35, Si 0.20 to 0.30. McInnes Steel Co., Corry, Pa.

McInnes-Cobalt
A high speed steel, for turning tools, tool holder bits, dies, containing C 0.70 to 0.75, Cr 3.50 to 4.50, Mn 0.20 to 0.35, Co 4.00 to 4.50, V 0.90 to 1.00, W 17.00 to 18.00, Mo. 0.45 to 0.55, Si 0.25 to 0.35. McInnes Steel Co., Corry, Pa.

McInnes Folder Die
Steel for brake dies and forming dies. Is very dense and stands up under high pressure. Contains C 0.90 to 1.05, Mn 0.25 to 0.35. McInnes Steel Co., Corry, Pa.

McInnes-Special
A high carbon, water hardening tool steel, for special tools requiring resistance to wear. Contains C 1.00 to 1.10, Mn max 0.30, Si 0.25 to 0.35. McInnes Steel Co., Corry, Pa.

McInnes-Special
A chrome-nickel, oil hardening hot work steel, for general hot work dies, shear blades, punches, etc. Contains C 0.65 to 0.75, Cr 0.50 to 0.60, Ni 1.10 to 1.35, Mn 0.60 to 0.70, Si 0.20 to 0.30. McInnes Steel Co., Corry, Pa.

McInnes S No. 4
Alloy steel for chisels and punches. Contains C 0.40 to 0.50, Cr 0.80 to 0.90, Mn 0.20 to 0.30, W 0.90 to 1.00, Mo 0.15 to 0.25, Si 0.20 to 0.30. McInnes Steel Co., Corry, Pa.

McInnes—V
A high speed steel, for turning tools, cutters, tool holder bits, dies, etc. Containing C 0.65 to 0.75, Cr 3.50 to 4.50, Mn 0.20 to 0.35, V 1.00 to 1.20, W 17.50 to 19.00, Si 0.20 to 0.35. McInnes Steel Co., Corry, Pa.

N

National
A high speed steel. Delaware Tool Steel Corp., Wilmington, Del.

N. C. Alloy
Oil hardening steel for shock tools, dies, shear blades, rivet sets, punches, etc. Has low distortion, high resistance to shock and fatigue and is very tough. Contains C 0.70, Cr 1.00, Ni 1.60, Mn 0.40, Si 0.20, Cu 0.35. Lehigh Steel Co., New York.

Neor
Oil and air hardening, non-deforming steel for dies and press tools. Contains C 2.30, Cr 13.00, Ni 0.40, Mn 0.40, V 0.25, Si 0.40. Darwin & Milner, Inc., Cleveland.

Nicroex
Oil hardening steel for brake dies and machine parts. Has good wear and fatigue resistance. Contains C 0.70, Cr 0.80, Ni 1.25, Mn 0.75, Mo 0.35, Si 0.35. Columbia Tool Steel Co., Chicago Heights, Ill.

Nicroman
Very tough oil hardening steel, for shears, punches and dies. Contains C 0.70, Cr 1.00. Ni 1.60. Henry Disston & Sons, Inc., Philadelphia.

No. 98
Hot work steel for dies. Heat and corrosion resistant. Contains C 0.45, Cr 9.00, Mo 2.00, Si 1.00. Henry Disston & Sons, Inc., Philadelphia.

999
A cobalt high speed steel. Halcomb Steel Co., Syracuse, N. Y.

96 KC
A special alloy steel. Jessop Steel Co., Washington, Pa.

Ni 932
A special alloy steel, containing Mn and Ni. Darwin & Milner, Inc., Cleveland.

Nipigon
A high speed steel, containing Co. Canadian Atlas Steels, Ltd., Welland, Ont., Canada.

Nivan
Cutlery Steel. Is edge holding and tough. Contains C as ordered, Cr 0.40, Ni 1.40, Mn 0.30, V 0.20. Henry Disston & Sons, Inc., Philadelphia.

Nivco
A water hardening steel, for mason tools, drills, etc. Contains C 0.80 to 0.90, Mn 0.30, Si 0.35. Agawam Tool Co., West Springfield, Mass.

NN
A non-deforming steel, containing Cr. Canadian Atlas Steels, Ltd., Welland, Ont., Canada.

Non-hardening
A special alloy steel. Vulcan Crucible Steel Co., Aliquippa, Pa.

Non Shrink
Oil hardening steel for stamping dies. Contains C 0.94, Mn 1.30, Mo 0.30. Kidd Drawn Steel Co., Aliquippa, Pa.

Nonshrink
Oil hardening steel for dies and tools. Contains C 0.95, Cr 0.75, W 1.50. Bissett Steel Co., Cleveland.

Non Shrinkable
An oil-hardening non-deforming die steel. Vulcan Crucible Steel Co., Aliquippa, Pa.

Non-Shrinkable
An oil-hardening non-deforming die steel. Vanadium-Alloys Steel Co., Latrobe, Pa.

Non-Shrinkable Oil-Hardening
Drill rods, for taps, reamers, broaches, gages, punches, dowel pins, welding rods, thread rolling dies, master tools. Contains C 0.90 to 1.00, Cr 0.43 to 0.57, Mn 1.15 to 1.25, V 0.15 to 0.25, W 0.43 to 0.57, Si 0.15 to 0.30, P. 0.03 max. S. 0.03 max. Anchor Drawn Steel Co., Latrobe, Pa.

Non-Shrinking Teemex
See Teenax.

Non-Tempering
Water hardening, tough chisel steel. Drawing of temper not required. Contains C 0.28 to 0.42, Cr 0.70 to 0.90, Ni 0.15 to 0.25, Mn 0.60 to 0.80, Mo 0.30 to 0.60, Si 0.30 to 0.65, Cu 0.35 to 0.55. Heller Brothers Co., Newark, N. J.

Normar
A special alloy steel. Ziv Steel & Wire Co., Chicago.

Novo No. 2
Vanadium high speed, oil hardening steel, for lathes, planing and cutting tools, containing C 0.82, Cr 4.23, Mn 0.26, V 2.21, W 18.91, Mo 0.64, Si 0.28, S 0.010, P 0.023. H. Boker & Co., Inc., New York.

Novo Superior
High speed, oil hardening steel, for lathe, planing and cutting tools, containing C 0.72, Cr 4.14, Mn 0.24, V 1.08, W 18.36, Si 0.27, S 0.011, P 0.022. H. Boker & Co., Inc., New York.

Novo Superior Vanadium
High vanadium, high speed, oil hardening steel, for lathe, planing and cutting tools, containing C 1.04, Cr 4.18, Mn 0.26, V 3.41, W 18.46, Mo 0.84, Si 0.27, S 0.012, P 0.023. H. Boker & Co., Inc., New York.

Nu-Die
Alloy tool steel, for aluminum die casting dies. Contains C 0.38, Cr 5.00, V 0.40, Mo 1.40, Si 1.00. Crucible Steel Co. of America, New York.

NuDie Casting
A very tough, air-hardening steel, for die casting of aluminum alloys. Resists heat-checking and scaling well. Contains C 0.38, Cr 5.00, Mn 0.40, V 0.40, Mo 1.40, Si 1.00. Hawkridge Bros. Co., Boston.

Nut Piercer
A tungsten hot work steel. Midvale Co., Philadelphia.

O

O Diamond
A special alloy steel, containing W, Cr and V. Poldi Steel Works, New York.

O. H. D.
A non-deforming steel. Simonds Saw & Steel Co., Lockport, N. Y.

Ohio Die
A high carbon, high chrome special steel. Colonial Steel Co., Pittsburgh.

O H T
Non-deforming, oil-hardening steel, containing C 1.00, Cr 0.50, Mn 1.15, V 0.15, W 0.50, Si 0.30. Darwin & Milner, Inc., Cleveland.

Oildie
Non-deforming, oil hardening steel for heavy blanking, piercing, shaving, trimming and forming dies, die sinking hubs, taps, reamers, etc. A non-shrinking steel with high strength and high hardness of great depth. Contains C 0.90, Cr 1.60, Mn 0.60, W 0.50, Si 0.25. Columbia Tool Steel Co., Chicago Heights, Ill.

Oil Hardening
A non-deforming steel, containing Mn. H. Boker & Co., Inc., New York

Oil Hardening
A non-deforming steel. Hobson, Houghton & Co., Inc., New York.

Oil Hardening Red Label
Oil hardening steel, for general tool and die work. Contains C 0.85 to 0.95, Cr 0.40 to 0.60, Mn 1.00 to 1.25, W 0.40 to 0.60, Si 0.25 to 0.45. Craine-Schrage Steel Co., Detroit.

Omega
A shock resistant steel for battering tools, containing C 0.58, Mn 0.70, V 0.12, Mo 0.30, Si 1.85. Bethlehem Steel Co., Bethlehem, Pa.

183 Mix
A special alloy steel. Crucible Steel Co. of America, New York.

One Star
A high speed tool steel. Contains C 0.72, Cr 4.0, V 2.0, W 14.0. Midvale Co., Nicetown, Philadelphia.

139 B
A special alloy steel. Jessop Steel Co., Washington, Pa.

Ontario
High-carbon-chrome, air hardening steel, for blanking, forming, cold trimmer punches and dies. Good resistance to abrasion and non-deforming quality. Contains C 1.50, Cr 12.00, V 0.25, Mo 0.80. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also Edgcomb Steel Co., Philadelphia.

No. 000 Double Extra Carbon
A plain carbon steel. Adams & Osgood Steel Co., Boston.

Orange Label
A water hardening tool steel, for fine tools as intricate punches, jewelry dies, engravers dies, fine shear blades, threading dies. Contains C 1.05 to 1.10. A. Milne & Co., New York.

Orange Label
Tough and shock resisting steel for chisels and punches. Contains C 0.45 to 0.55, Cr 1.25 to 1.75, Mn 0.30 to 0.40, V 0.20 to 0.30, W 2.00 to 3.00, Si 0.20 to 0.30. Heller Brothers Co., Newark, N. J.

Orange Label Chisel
A special alloy steel, containing Cr, W and V. Heller Brothers Co., Newark, N. J.

Orion
Water hardening steel, for punches, chisels and structural parts. Resistance to fatigue and very tough. Contains C 0.50, Cr 1.00, Mn 0.60, V 0.20, Si 0.25. Universal-Cyclops Steel Co., Bridgeville, Pa.

O S N
A high carbon, high chrome steel. Latrobe Electric Steel Co., Latrobe, Pa.

P

Panther Extra
A 14-4-2 plus 5 per cent cobalt-high speed, air or oil hardening steel, similar to Panther Special. Better for finishing cuts than Panther Special. For lathe, planer, or boring tools. Contains C 0.80, Cr 3.75, Co 5.00, V 2.00, W 14.00, Mo 0.70. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also Edgcomb Steel Co., Philadelphia.

Panther Special
Same as Super Panther but with lower cobalt. For tools for heavy cuts on cast iron or steel, stainless, or heat treated alloy steel. Develops high degree of red hardness. Contains C 0.75, Cr 4.50, Co 5.00, V 1.00, W 19.00. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also Edgcomb Steel Co., Philadelphia.

Para
A special alloy steel, containing W, Cr and Va. Universal-Cyclops Steel Co., Bridgeville, Pa.

Paragon Oil Hardening
Oil hardening, non-deforming steel, for bakelite molding dies, broaches, gages, hobs and other forming tools, master tools, reamers, stamping and blanking dies, etc. Contains C 0.95, Cr 0.60, Mn 1.60, V 0.25. Crucible Steel Co. of America, New York.

Par-Exc
A special alloy die steel, containing W, Cr and V. Vanadium-Alloys Steel Co., Latrobe, Pa.

Park
An extra carbon steel. Crucible Steel Co. of America, New York.

Park Silver
A plain carbon steel. Crucible Steel Co. of America, New York.

P. B.
A plain carbon steel. Patriarche & Bell, New York.

Peerless A
A hot work steel, for small forging gripper dies, punches, nut boxes, forging insert dies, die casting dies, etc. Contains C 0.28, Cr 3.25, V 0.25, W 9.00. Crucible Steel Co. of America, New York.

Peerless B
A hot work steel, for extrusion dies, brass forging dies, etc. Contains C 0.45, Cr 2.75, V 0.40, W 15.00. Crucible Steel Co. of America, New York.

Peerless C
A hot work steel, for extrusion dies, die casting dies, etc. Contains C 0.30, Cr 2.75, V 0.40, W 15.00. Crucible Steel Co. of America, New York.

Peerless D
A hot work steel, for railroad spike dies, brass forging dies, permanent molds, etc. Contains C 0.45, Cr 2.00, V 0.20, W 11.00. Crucible Steel Co. of America, New York.

Penco
A plain carbon steel. Peninsular Steel Co., Detroit.

Pennant
A non-deforming steel, containing Mn and V. Delaware Tool Steel Corp., Wilmington Del.

Pen-Van
A special alloy steel, containing Cr and V. Peninsular Steel Co., Detroit.

Perdurum
A European tungsten carbide. See Tungsten Carbide.

Phoenix
A chrome alloy hot work steel. Columbia Tool Steel Co., Chicago Heights, Ill.

Phoran
A European tungsten carbide. See Tungsten Carbide.

Plancher
An oil hardening steel, for shear blades, punches, etc. Is shock resisting. Agawam Tool Co., West Springfield, Mass.

Planet Choice
A plain carbon steel. A. R. Purdy Co., Inc., New York.

Planet Drill Rod
A plain carbon steel. A. R. Purdy Co., Inc., New York.

Planet Extra
A plain carbon steel. A. R. Purdy Co., Inc., New York.

Planet High Speed
A high speed steel. A. R. Purdy Co., Inc., New York.

Planet Non-Shrinking
A high speed steel. A. R. Purdy Co., Inc., New York.

Planet Regular
A plain carbon steel. A. R. Purdy Co., Inc., New York.

Planet Special
A plain carbon steel. Edgcomb Steel Co., Philadelphia.

Planet Special
A plain carbon steel. A. R. Purdy Co., Inc., New York.

Planet X9
A high speed steel. A. R. Purdy Co., Inc., New York.

Plastalloy
Soft and tough hobbing alloy for molds. Contains C 0.10 max., Cr 0.50, Ni 1.20. Henry Disston & Sons, Inc., Philadelphia.

Plastinon
A very soft hobbing iron for molds. Contains C 0.10 max. Henry Disston & Sons, Inc., Philadelphia.

Polaris
Tough cutlery steel for knives. Contains C as ordered. Ni 0.70, Mo 0.15. Henry Disston & Sons, Inc., Philadelphia.

Poldi MK
A high speed steel, containing Co. Pittsburgh Tool Steel Wire Co., Monaca, Pa.

Poldi Stabil
A non-deforming steel, containing Mn and V. Poldi Steel Works, New York.

Polhem Drawing Die
A special alloy steel, containing Mn, W and Cr. Ryer Incorporated, Ltd., Los Angeles.

Polhem Wire Drawing
A special alloy steel, containing Mn, Cr and W. Swedish Steel Mills' A.A., Inc., New York.

Pompton Extra
A general purpose carbon tool steel with a wide hardening range. Contains C 0.70, Mn 0.25. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also Edgcomb Steel Co., Philadelphia.

Pompton Special
A general purpose carbon tool steel with a wide hardening range. Contains C 0.70 to 1.30. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also Edgcomb Steel Co., Philadelphia.

Port Pitt
A plain carbon steel. Vulcan Crucible Steel Co., Aliquippa, Pa.

Potomac
General purpose, air or oil hardening steel, for aluminum die casting dies, forging machine plungers and inserts, extrusion dies, etc. Resists shock and sudden temperature changes. Withstands water cooling. Contains C 0.30, Cr 5.00, V 0.25, W 1.25, Mo 1.75, Si 1.00. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also Edgcomb Steel Co., Philadelphia.

£. s. d. Cast Steel
A plain carbon steel. Edgar Allen & Co., Ltd., Montreal and New York.

Pressurdie 1
A hot work steel, for extrusion dies, rams and punches, containing C 0.30-0.40, Cr 4.75-5.50, Mn 0.20-0.35, V 0.15-0.25, W 4.75-5.50, Mo 0.15-0.25, Si 0.80-1.00. Braeburn Alloy Steel Corp., Braeburn, Pa.

Pressurdie 2
A hot work steel, for extrusion dies, rams and punches, containing C 0.32-0.37, Cr 4.50-5.50, Mn 0.20-0.50, V 0.10-0.15, W 0.90-1.25, Mo 1.25-1.75, Si 0.80-1.00. Braeburn Alloy Steel Corp., Braeburn, Pa.

Pressurdie 3
A hot work steel, for die casting dies, containing C 0.32-0.37, Cr 4.90-5.25, Mn 0.55-0.65, V 0.10-0.15, Mo 0.45-0.60, Si 0.85-1.00. Braeburn Alloy Steel Corp., Braeburn, Pa.

PRK 33
A non-deforming steel. Ziv Steel & Wire Co., Chicago.

PRK-33 Cast-to-Shape
An air hardening steel, used for cut edges and forming. Contains C 1.45 to 1.60, Cr 11.50 to 12.50, Mn 0.40 to 0.50, Si 0.40 to 0.60, Mo 0.90 to 1.00, Co 3.00 to 3.50, Ni 0.40 to 0.50. Forging and Casting Corp., Ferndale, Mich.

Progen
A very hard and tough steel which hardens in water with no tempering. For shock tools, chisels, pneumatic tools, punches, shear blades, and blacksmiths' tools. Seaboard Steel Co. of America, New York.

Purco Chisel
A plain carbon steel. A. R. Purdy Co., Inc., New York.

Purple Label
Water hardening, commercial blacksmith tool steel. For blacksmith tools, chisels, crowbars, etc. Is hard and tough. Contains C 0.50 to 1.10, Mn 0.60 max., Si 0.10 to 0.30. Heller Brothers Co., Newark, N. J.

Purple Label
A high speed steel, used where price of steel is not of primary importance. Contains C 0.73, Cr 4.15, Mn 0.23, Co 5.00, V 1.15, W 18.25, Mo 0.50, Si 0.25. Jessop Steel Co., Washington, Pa.

Pyro
A tough, water-hardening or oil-hardening steel, for hot header dies. Contains C 0.45, Ni 0.95, Mn 0.70, V 0.20, Si 0.25. Hawkridge Bros. Co., Boston.

Pyro Die
A hot work steel, for rivet sets and header dies. Contains C 0.40, Cr 1.00, V 0.25. Crucible Steel Co. of America, New York.

Python
Carbon-vanadium, water hardening shock resisting steel, for punches, dies, shear blades, rivet sets. Develops high degree of hardness, and resistance to fatigue. Contains C 0.90, V 0.25. Allegheny Ludlum Steel Corp., Watervliet, N. Y.; also Edgcomb Steel Co., Philadelphia.

R

Ramet
Tantalum carbide cutting material made by Fansteel Metallurgical Corp., North Chicago, Ill.

R. B. Chisel
Chisel Steel, containing C 0.45-0.50, Cr 0.75-0.85, Mn 0.70-0.80, Si 0.50-0.60. Braeburn Alloy Steel Corp., Braeburn, Pa.

R. D. S.
Tough oil-hardening tool steel for slitting shears, forming rolls, punches, etc. Has toughness, hardness, is non-deforming and fatigue resistant. Contains C 0.75, Cr 1.00, Ni 1.75, Mn 0.30, Si 0.25. Carpenter Steel Co., Reading, Pa.

Record A
Hot work steel, for hot piercing and for gripper dies. Contains C 0.30 to 0.35, Cr 3.25 to 3.75, Mn 0.10 to 0.30, V 0.30 to 0.60, W 9.00 to 12.00, Si 0.20 to 0.40. McInnes Steel Co., Corry, Pa.

Red Anchor
Carbon drill rods, for punches, drills, dental tools, pins, rollers, mandrels, taps, cold heading dies, needle bars. Contains C 0.95 to 1.10, Cr 0.10 max., Ni 0.10 max., Mn 0.15 to 0.40, Si 0.20 max., P 0.05 max., S 0.04 max. Anchor Drawn Steel Co., Latrobe, Pa.

Red Cut Cobalt
A Cobalt high speed steel, containing W, Cr and V. Vanadium-Alloys Steel Co., Latrobe, Pa.

Red Cut Superior
A high speed steel, containing W, Cr and V. Colonial Steel Co., Pittsburgh.

Red Cut Superior
A high speed steel, containing W, Cr and V. Vanadium-Alloys Steel Co., Latrobe, Pa.

Red Label
Oil hardening steel, for general tool and die work. Contains C 0.85 to 0.95, Cr 0.40 to 0.60, Mn 1.00 to 1.25, W 0.40 to 0.60, Si 0.25 to 0.45. Caine-Schrage Steel Co., Detroit.

Red Label
High speed steel for metal cutting tools. Contains C 0.65 to 0.75, Cr 3.00 to 4.00, Mn 0.25 to 0.35, V 1.00 to 1.50, W 18.00 to 20.00, Si 0.25 to 0.40. Heller Brothers Co., Newark, N. J.

Red Label
A tough general purpose steel of water hardening carbon tool steel classification; is extremely tough and stands well in chisels. Contains C 0.95 to 1.00. A. Milne & Co., New York.

Red Label
A special carbon steel. Simonds Saw & Steel Co., Fitchburg, Mass.

Red Label
A water hardening steel, for draw, blanking and forming dies. Contains C 1.00, Mn 0.30, Si 0.20. Peninsular Steel Co., Detroit.

Red Shadow
An oil hardening steel, for hot milling, upsetting, and general hot work. Contains C 0.40, Cr 3.10, Mn 0.25, V 0.25, W 10.00, Si 0.40. Agawan Tool Co., West Springfield, Mass.

Red Star
Tungsten drill rods, for center drills, dies, taps dental burrs, punches, gages, finished tools, forming tools and reamers. Contains C 1.15 to 1.25, Cr 0.60 to 0.80, Mn 0.20 to 0.30, V 0.15 to 0.25, W 1.50 to 1.70, Mo 0.20 to 0.30, Si 0.20 to 0.35, P 0.03 max., S 0.03 max. Anchor Drawn Steel Co., Latrobe, Pa.

Red Streak
A high speed steel. Simond Saw & Steel Co., Lockport, N. Y.

Red Tiger
Special high-carbon, high-vanadium steel suitable for wide variety of jobs, ranging from heavy hobbing cuts to fine finishing operations. Contains 18 W, 4 Cr, 2.5 V, 0.60-0.80 Mo, and 1.0 C. Bethlehem Steel Co., Bethlehem, Pa.

Regal No. 2
A special alloy steel. Vulcan Crucible Steel Co., Aliquippa, Pa.

Regin 711
Oil hardening, cold and hot work steel is shock resisting, containing C 0.50, Cr 1.25, Mn 0.20, V 0.20, W 2.50, Si 0.75. Uddeholm Co. of America, Inc., New York.

Regluar
A water hardening steel, for hammers, chisels, screw drivers, etc. Contains C 0.70 to 0.80, Mn 0.35, Si 0.30. Agawam Tool Co., West Springfield, Mass.

(TO BE CONTINUED NEXT WEEK)

Cross-mounting of the motor contributes substantially to the rigidity of Milwaukee Milling Machines and assures a smooth, vibration-free flow of power at all speeds and feeds. Side-mounting permits machine to be placed back-to-wall.

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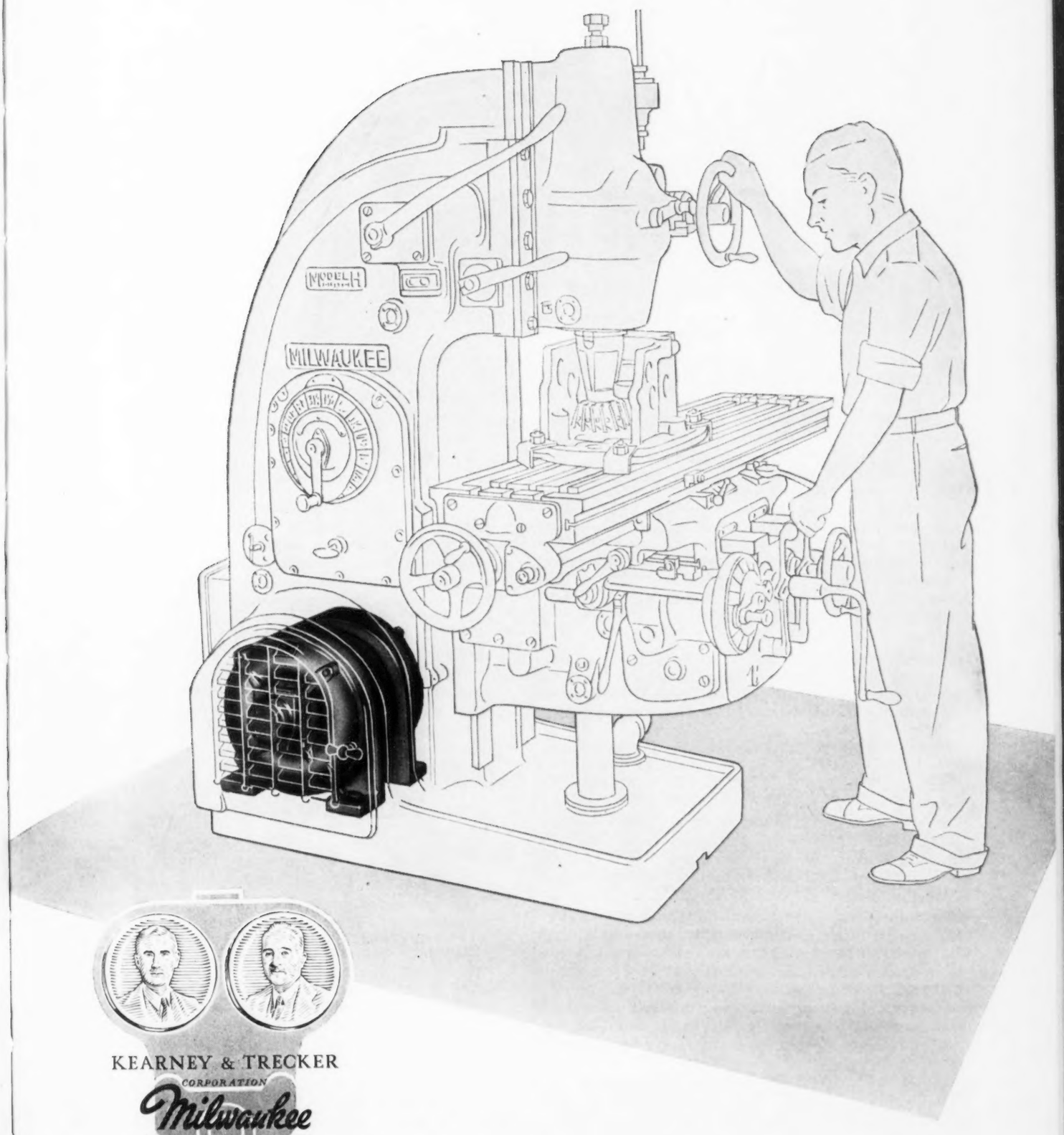

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MILLING MACHINES

MILWAUKEE MILLING MACHINES

On The Assembly Line

BY W. F. SHERMAN
Detroit Editor

• Auto makers study long-term effects of priorities and material shortages on car design and production methods . . . Quality not likely to suffer . . . Weights of vehicles may rise 10 to 50 lb. . . . Prices on lower-range cars likely to advance $25 to $50.

DETROIT — It is not too early, nor too unimportant a task, to begin an evaluation of the long-term effects which priorities and material shortages will have on automobile design and production methods.

Such an evaluation now is timely, despite the fact that the best authorities in the industry don't know yet where they stand on many important questions of substitution. Even now, attempts at evaluation are being made by these authorities because the broader viewpoints will guide them through the critical period and give better over-all results. The problems of the automobile industry in this present emergency are of peculiar interest and importance to a large part of the nation because the auto industry is the center of such widespread influence on other industry.

An authoritative analyst has pointed out that there are seven main factors that will control the probability of adopting various proposed and possible substitutes. These are:

Available supply of proposed substitute.
Influence on quality.
Effect on cost.
Requirement for tooling.
Man-hours, both on tools and on production.
What may be accomplished by design changes.
Possibility of using substitute methods of manufacture.

Of the seven, the first has been most talked about, and available supply will be the determining factor in many cases. It has been pointed out, however, that necessary information about availability of materials is as yet either not generally available, incomplete, or contradictory. Authorities repeatedly point out that while there are now apparently some real shortages, there are also some false reports of shortage, and reasonable doubts existing as to the authenticity of some of the data on the subject of availability. Duplication in estimates of requirements, the allocation of some material for work that is as yet only on paper, and speculation in stocks of material have produced all the effects of shortage, whether it is real or not. For instance, responsible sources of information assert that zinc for die casting *is* available, but at an asking price of 20 cents a pound!

Allocation Needs Revamping

The question of availability is complicated by the fact that rapidly changing conditions of supply interfere with accurate predictions and decisions. Again, it is pointed out, curtailment in automobile production will have the effect of increasing the amount of each metal available. On this score, it has been proposed that the entire method of alloting hard-to-get materials is in need of revamping. While the industry acknowledges that restrictions in quantity of certain supplies is inevitable, it objects to being hampered by being told just how it must use its allotments. Some manufacturers may be better able to use nickel, for instance, as an alloying material in valves which must operate in a hot-running engine, while another will be able to save much in tool and change-over cost if allowed to use a small amount of nickel for plating. Some flexibility is desirable, therefore, and it seems better that Washington should allot a specified maximum quantity to be used at the discretion of the manufacturer, rather than controlling by edict the purposes for which the metal can be used.

It is also being advocated that allotments to each company should take into account the savings that this particular company may already have made in each metal. By allowing the company to participate in its own savings of strategic or critical materials, an incentive for savings would be created.

Automobile quality is not likely to suffer in the long run when substitutions are made. The industry is on guard against possibilities of lowered quality and is spending a great deal of money today to make sure that substitutions are within acceptable ranges as regards quality. There are some cases where quality probably will be improved, and there are certainly going to be spots where the industry will be forced to put more costly parts into cars to make quick substitutions. Weights of vehicles will go upward—probably about 10 lb. for the average "light" car, ranging up to 40 or 50 lb. for larger automobiles.

Cost Increase One Result

The main effect will probably be an increase in cost —and that has been estimated at $25 to $50 for cars in the lower price range. About $10 has already been added to the manufacturing costs of one of the cars in this class. The cost increases will originate in greater raw material cost; increased machining where machined castings must be substituted for die casting, or where more expensive machining or finishing will have to be done to eliminate plating, etc.; and in the outlay necessary for tooling. It has been pointed out also that some substitutions will require the use of more pounds of tool materials to do additional machining operations, so this may add to requirements

Are you machining ALUMINUM?

These are the tool characteristics that work best . . . . .

P&W sales engineers can help you find the tool angles and design that will cut best on your aluminum work.

IT is important to have *sharp* cutting edges, and smooth, highly polished cutting faces when machining aluminum. Burred or dull edges will tear this metal and cause trouble. It cuts freely with keen tools ground on a fine abrasive wheel. Occasional hand stoning will improve results between grinds.

In general, tools designed for cutting steel will work on aluminum, but slight modifications will improve their efficiency tremendously.

Milling cutters and end mills should have coarse teeth and plenty of chip room. The rake should be increased to 20°. This will produce a better shearing action and tightly curled chips. Highly polished spiral flutes work best, and notched cutting edges will keep down the chip size.

Taps should be undercut and have highly polished flutes. Ordinary tap rake angles (6° to 8°) should be increased to from 12° to 15°. Spiral pointed taps work well in aluminum, and on deep blind holes taps with right hand spiral flutes will pull the chips up and save tearing. On taper taps it is well to reduce the relief slightly so that chips left clinging to the threads on reversal will be sheared off closely as the tap is backed out of the hole.

Reamers ordinarily are made with no rake, but when machining aluminum they should have 5° to 8° rake to improve the shearing action. Saws should have coarse teeth, a 15° rake, and double the clearance used in cutting steel. In some cases good practice calls for one saw tooth cutting deep and the next one wide, with a positive feeding device to prevent "digging in." Saws made for cutting steel can be altered for aluminum by removing every other tooth to provide extra chip room. changing the rake angle as mentioned above, and polishing the various surfaces to reduce chip friction.

Turning tool angles differ from those used for steel. Top rake increases, and varies from 20° up depending on the tool and the operation. Side rake from 10° to 20° helps to smooth out the cut. Clearance should be from 8° to 10°.

One of the most difficult aluminum alloys to machine contains 10% silicon, and is commonly used for automotive pistons. Carbide tipped tools work best on this highly abrasive material.

In general use high cutting speeds with fine feeds. Usually more metal can be removed successfully by increasing the speed rather than the feed. Much heat is generated when feeds are heavy, and this causes excessive expansion troubles on centers and will produce inaccurate results. Special soluble cutting oils or a mixture of kerosene with either paraffin or lard oil should be used in large streams to offset overheating. Always cool the work before measuring for final results.

If you have special cutting tool problems never hesitate to ask a Pratt & Whitney sales engineer for help. *We stand ready to do everything possible* to aid our friends and do our full part in speeding up *national defense.* We've been making cutting tools for 80 years and our experience and knowledge are yours for the asking. Write to PRATT & WHITNEY, Division Niles-Bement-Pond Company, WEST HARTFORD, CONN.

PRATT & WHITNEY

ONE OF A SERIES TO MAKE PRATT & WHITNEY RESEARCH AVAILABLE TO AMERICAN SHOPS

MASS OUTPUT OF TOOLS: Heavy orders for machine tools in the last 18 months has warranted the use of mass production methods in machine tool plants, like the power-driven conveyor line shown here at the Norton Co. plant at Worcester, Mass. Norton Co. now has five such grinding machine lines in operation.

for tungsten, molybdenum, etc.

Increases in both productive and non-productive man-hours (not counting the fact that wages for these man-hours will be higher) will add another increment to the cost. The extra labor required will increase the labor shortage which is feared. In the latter connection it is worth repeating that a great many people in the industry think that a labor shortage will arise to cripple production before serious effects are felt because of material shortages.

Probably too little consideration has been given to some of the simple design changes which might eliminate need for quantities of hard-to-get metals. An illustration offered recently in connection with automobile valve design is an apt one. In engines which require alloyed valves because of the great heat in the engine, it might be possible to substitute other materials by increasing the angle under the head of the valves and adding 10 or 15 thousandths stock on the top face. Cooperation of this sort between engineering departments and materials men may provide simple solutions to difficult problems.

Alternate Production Methods

Put forth as the seventh item on the list above is the one that has untold possibilities—both in finding immediate solutions to problems created by material shortages and as a basis for great improvement in the motor cars of the future. Alternate methods of manufacture, in some cases using the same or similar material and in other cases using a different material, may produce long-term effects of utmost importance. Centrifugally cast steel parts in place of forged or upset parts is one of the suggestions being advanced. The tool cost for steel parts made in this manner is lower than for forged or upset parts. Powder metallurgy is another of the arts that can be called upon. Undoubtedly it will see much more widespread application within the next year.

The auto industry is counting on this use of alternate production methods as perhaps its most important ace in the hole when it starts to produce airplane parts. There has already been some acceptance of spot welding on structural parts and also acceptance of rolled threads instead of cut threads, for example. It is not generally known, but centrifugally cast cylinder sleeves for air-cooled engines have shown so much promise that it seems safe to predict eventual acceptance of these. Ford Motor Co., extensive user of the centrifugal casting method, is conducting experiments along this line in connection with the manufacture of the Pratt & Whitney engine. At present the blank from which cylinders are machined for this engine weigh 74 lb., while the centrifugal casting weighs only 26 lb. It is estimated that on the quantity of engines which Ford originally was scheduled to build in the air defense program, the centrifugal casting method might mean a saving of 2,000,000 lb. of steel, going all the way back to the mill in the calculations. Both for automotive and aviation engines it appears that cast crankshafts still have unexplored possibilities. At least three instances are known in which aviation engine crankshafts have been cast successfully.

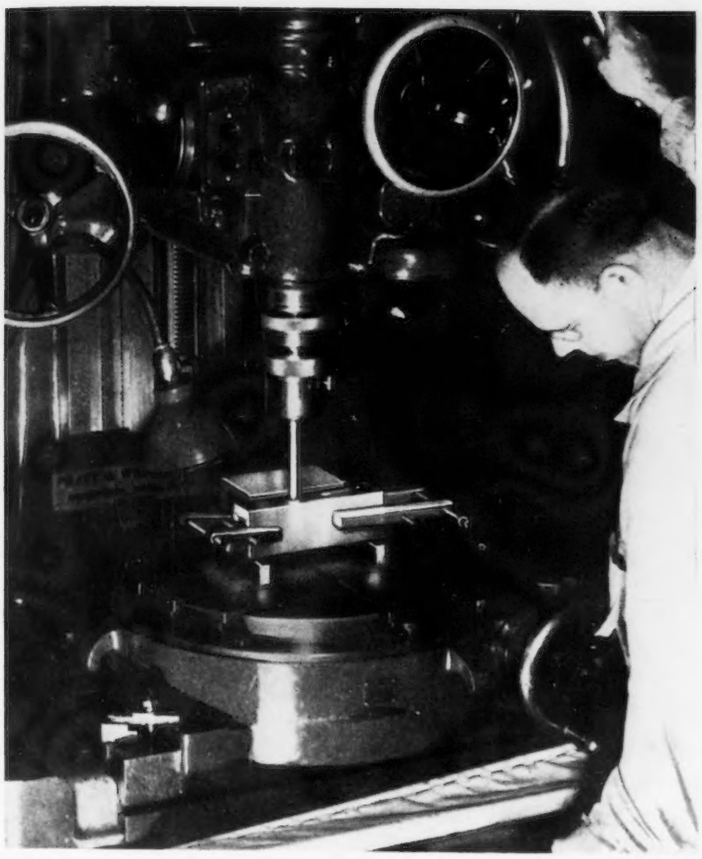
Chevrolet's Engine Plans Progress

Chevrolet's plans for producing Pratt & Whitney aircraft engines appear to be taking more definite shape. It is now reported that the engine will be the 14-cylinder type. (Ford is producing the 18-cylinder P&W). Considerable shake-up in Chevrolet's engineering department impends, since the technical personnel will be drawn from the present automotive forces.

Another contract for aviation manufacturing just announced is that of Hudson Motor Car Co. for the construction of rear fuselage sections for the Martin B-26B bomber. This will be an educational order and precedes a contract for quantity production.

Automobile production in the past week was resumed on a five- to six-day schedule, following the Memorial Day holiday. Output totaled 133,645, compared with 106,395 in the previous week and 95,560 in the corresponding week of last year, according to Wards Reports, Inc.

WHAT IS THE TRUE MEASURE OF TOOL PERFORMANCE?



IS it the *life* of the tool in pieces? Or is it the total output of the machine or press *over a period of time?*

It is not how many pieces a tool will make that counts—but how *quickly* it will make them. Almost anyone could make a blanking die so heavy that with frequent pauses for regrinding, it could produce a million pieces. The trick is to make a million-piece die requiring *no* regrinds—or only one or two. The real secret of high production is *uninterrupted* production.

That calls for top quality in tools, perfect design, expert tool making, correctly selected tool steels, exact heat treating procedures. Right there is where Carpenter can give you help, with a program for simplifying and improving tool steel selection and heat treatment. More than 1,000 plants are using this program to get *better* tools and reduce interruptions to production. Savings as great as 60 hours per month for a single machine have been obtained.

If you could afford 14 minutes to learn more about this program, write on your company letterhead for a free copy of our booklet, "Spot-lighting Hidden Plant Capacity." For executives, responsible for getting more out of present equipment —this booklet is an eye-opener.

USERS IN U.S.A.

THE CARPENTER STEEL COMPANY, 121 Bern Street, READING, PA.

FREE TO TOOL STEEL

Carpenter
MATCHED
TOOL STEELS

Washington

BY L. W. MOFFETT
Washington Editor

• Six companies would share in suggested 10-million ton steel capacity increase... Expansionists fire away at second Dunn report's cold logic, as at first report . . . Serious labor shortage involved by program is ignored.

WASHINGTON — In his second report to President Roosevelt on steel, Gano Dunn said that to construct requisite facilities to expand capacity by 10,000,000 tons would require 4,160,000 tons of ingots and take two years, if not more, to build, even with priorities for equipment.

At his press conference on the day the report was submitted to him, the President, still able to enjoy a good story, said Mr. Dunn used a nice simile to illustrate his point. Mr. Dunn, it was disclosed, reminded the President of a Mark Twain story. It related to Mississippi River boats that were engaged in a contest to see which one could whistle the loudest. The trouble was, the President said, it was found that the boat that could whistle the loudest had to stop and use all of its steam. Therefore, the President said the question was whether to use the 4,000,000 tons of steel for constructing new capacity now in order to get the additional supply in two years. He added that study was being given to the alternative of curtailment in civilian consumption or increasing capacity.

It now develops that ardent New Deal expansionists want to bring the boat to a stop and use all of its steam so that it can whistle the loudest. Just as they engaged in sharpshooting at the first Dunn report as soon as it was presented, so also they have done regarding the second report.

The fact that both reports were carefully and painstakingly prepared under expert direction meant nothing to the wide-scale expansionists. So far as they are concerned the studies were a wasted effort, unless it is that they obtained pleasure in their cynical disregard of the reports. The expansionists insist on butter and guns, the products listed in the order of their importance to the expansionists. At the same time they indulge in apoplectic tirades beseeching industry to speed defense production, but conveniently lapse into complacent indifference if labor throws a monkey wrench into the machinery.

Shoot At 10,000,000 Tons

They refuse to be satisfied with the recommendation of W. A. Hauck of the OPM Steel Unit, for a 1,115 200-ton expansion as a means of making the Pacific Coast independent of Eastern supplies, because of the vulnerability of the Panama Canal and the possible congestion of transcontinental railroads. The expansionists are shooting at a minimum increase of 10 000.000 tons, lifting the total capacity of the country to the vast figure of 103,000,000 tons. To this end expansionists and other government representatives have gone into conference with steel executives, and it has been stated that a "tentative" 10,000,000-ton plan expansion was discussed, the money to be obtained from Federal Loan Administrator Jesse Jones, who himself has said steel expansion is not necessary, except possibly "here and there."

Talk is heard that the expansion will not take on the full bulge of 10,000,000 tons, but that it will exceed considerably the increase suggested for the Pacific Coast and will be spread to other sections. But specific expansion quotas to make a 10,000,000-ton increase are said to have been proposed for distribution among the steel companies. As reported, suggested increases were allotted as follows: United States Steel Corp., 3,200,000 tons; Bethlehem Steel Co., 1,800,000 tons; Republic Steel Corp., 1,400,000 tons. This makes a total of 6,400,000 tons. The bulk, if not all, of the remaining 3,600,000 tons, so it is said, would be assigned to the Jones & Laughlin Steel Corp., the National Steel Corp., and the American Rolling Mill Co.

The proposed increases would call for increases in coking, blast furnace, open hearth and rolling mill capacity, which certainly poses the problem of getting the necessary additional supplies of raw materials. Already there is particular concern over the scrap supply situation. Mr. Dunn reported that the prospective deficits in Great Lakes transportation capacity, blast furnace capacity and coke oven capacity forecast for Dec. 31, 1942, in his first report, have been removed. But the deficits would be restored if a 10,000,000-ton increase in capacity were projected.

Serious Labor Problem Involved

Mr. Dunn also brought out clearly in his report the serious labor problem that would be involved if an attempt were made to increase steel capacity to 102,400,000 tons. This figure was a readjustment from an estimate of 120,000,000 that OPM, Price Administrator Leon Henderson and other expansionists have advocated.

"On account of the limitation of labor supply, this adjusted estimate (102.4 tons in 1942) would * * * be very difficult to realize, even if the capacity of the industry were adequate to it, which it is not," said Mr. Dunn.

Mr. Dunn pointed out that a 10,000,000-ton horizontal increase of capacity would have to include the following:

Ore mine development and equipment; railroad

AMERICAN MONORAIL
Increases Plant Capacity

Handling service furnished by American MonoRail interrelated cranes over the nation's largest aircraft assembly floor—plant of The Glenn L. Martin Company.

BEFORE YOU EXPAND *Explore* **AMERICAN MONORAIL**

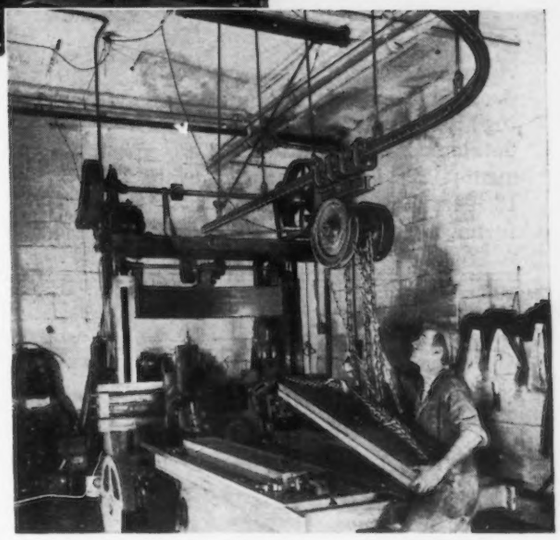
EVERY day more plants are adding capacity by putting their floor space to better use—by putting carrying jobs **overhead** with American MonoRail.

They find that materials and products are thus kept on scheduled routes—no congestion, no damage in transit.

The men, too, relieved from lifting and carrying, give full time and skill to production and accomplish more.

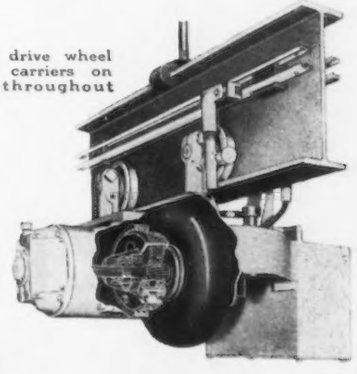
Since standard parts are assembled into complete systems to meet the special requirements of the particular job, the cost of American MonoRail is surprisingly moderate. Operation and maintenance are a minimum. Supplied for manual, electric or automatic operation.

Let us arrange for an American MonoRail engineer to survey your requirements at no obligation.



Easy placing of heavy die blocks in planer with no damage to dies or machinery.

Rubber drive wheel propels carriers on cranes throughout system.



Write for copy of "Blue Book" showing hundreds of installations.

THE AMERICAN MONORAIL CO.

13103 ATHENS AVENUE **CLEVELAND, OHIO**

Photo by British-Combine

POCKET DESTROYER: Speedy motor launches, shown here, are now being used by Britain for general patrol and anti-submarine work.

equipment (locomotives and cars); dock facilities (loading and unloading); 30 lake vessels; coal mine development; limestone development; 1200 by-product coke ovens; 18 blast furnaces; 100 open hearth furnaces; electric furnaces; rolling mills; finishing equipment and electric power and drives.

The capital cost, he said, would be $1,250,000,000.

The Dunn report estimated 67,000,000 tons of steel would be available for civilian needs in 1942, while Mr. Henderson figures 36,000,000 tons, a difference of a mere 31,000,000 tons. Mr. Dunn has specified in detail his figures, which, it may be pointed out, exceed by 12,000,000 the greatest civilian consumption of steel, which was in 1940. Mr. Henderson has glibly commented that "you can't even run a depression on 36,000,000 tons," much less a rising industrial activity, which hardly disposes of the problem.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

Plants Leased to Make Wire for Signal Corps

Washington

• • • **Lease agreements** totaling $1,367,007 to provide for construction of one plant and equipment of three for the manufacture of assault wire for the signal corps have been announced by the Defense Plant Corp.:

Anaconda Wire & Cable Co., $353,723.70, of which $104,245 will be used for land and building at Marion, Ind., and $249,478.70 will be used for the purchase of equipment for the plant.

Okonite Co., Passaic, N. J., $293,884.78 for machinery and equipment at Paterson, N. J.

United States Rubber Co., New York, $719,400 for machinery and equipment for plant at Bristol, R. I.

A lease agreement for $200,000 also was made with the Hudson Machine Tool Co., Hudson, Mass., for purchase of machinery and equipment to be used in expanding production of broaching machines and broaching tools.

War Office Forms Service to Protect Defense Plants

Washington

• • • **Creation of a new** inspection service designed to protect defense plants and government property against damage likely to retard defense production has been ordered by the War Department.

The new organization to be known as the plant production inspection service will be set up in 21 major Army procurement districts to safeguard defense production in 43,000 plants working on rearmament orders.

Text of OPM Request On New Steel Capacity

• • • The OPM issued this statement regarding the plan to increase steel production by 10 million tons:

"The Office of Production Management has informed the Executive Subcommittee of the Iron and Steel Industry Defense Committee that the government desires to consider a plan to enlarge the annual capacity of the steel industry by approximately ten million tons of ingots in the shortest possible time.

"The subcommittee has been asked to canvass members of the iron and steel industry to determine which companies can enlarge their plants, and to report back to the OPM at the earliest convenient date.

"Companies desiring to participate in the plan have been asked to submit information to the OPM giving the tonnage capacity they believe they can add to their present capacity; the geographical location of this capacity; its cost; the finished products it would be ready to produce; the time required for such enlargement, given proper priorities; the estimated amount of steel required for such enlargements; and the proposed methods of financing.

Draft Board Defers Reuther; Secretary-Wife is Dependent

Detroit

• • • **Walter P. Reuther,** head of the General Motors division of the United Automobile Workers (CIO), has been placed in class 3-A under Selective Service by Appeal Board No. 3, Detroit. Reuther had asked for occupational deferment to class 2-A and was backed in his request by R. J. Thomas, UAW-CIO president, and Phillip Murray, CIO president, who declared that he was essential to peaceful relations in the automobile industry. The deferment, however, was granted on the grounds that Reuther's wife, who is her husband's confidential secretary in the union office, would be out of employment if he were inducted. It has been reported that Reuther might go to England to study labor conditions there for the government.

SAN FRANCISCO — Further withdrawal of ships from the intercoastal run is rapidly drawing the noose around present Pacific Coast steel price structures. Although the trap may not be sprung by complete withdrawal of bottoms for a few weeks or months, most Pacific Coast buyers have given up the thought of seeing Pacific Coast base prices as a live factor in their purchasing of items which originate entirely from Eastern mills.

Although the Pacific Coast base prices are still posted, and no doubt will continue to be exhibited in deference to OPAC orders, they presuppose water shipment. Were a customer to insist upon these prices, and assuming he could find some firm who would book his order, his prospects of early delivery, even with a few intercoastal ships still left, would be extremely slight. The time is not far off when he might expect his steel ten years after infinity, or at least after the war.

The practice has been, and no doubt will continue to be, when all-rail shipment is specified, to compute the price from the basing point nearest point of shipment and add freight to destination. That is the practice on products which are manufactured only in Eastern mills.

Sheets, Tin Plates Affected

The dilemma whose horns threatened to toss many sellers entirely out of the Coast market lies with items which are produced in Pacific Coast mills in varying quantities, but which also have been brought from Eastern producing points to a large extent. In this category fall sheets, tin plates, wire and wire products, rods, some sizes of structural shapes and other items in smaller quantities.

In the case of Bethlehem and the Steel Corporation, orders in these classifications have been filled both from Coast and Eastern mills, as respective Coast operations permit.

• Withdrawal of ships from intercoastal run draws noose around Pacific Coast steel price structure . . . Three aircraft firms to produce modified "Flying Fortress" . . . North American Aviation workers out on strike.

Firms with Pacific Coast mills obviously must retain Pacific Coast basing point prices on the products of these mills. On the other hand, with the capacity of their Coast mills inadequate to fill anywhere near all the orders booked in such products, these firms will have to resort to all-rail pricing from Eastern production centers to make up the deficiency. Wise heads are going to be needed to figure out a multiple pricing system to take care of this question of multiple points of origin.

If the pricing question facing operators of both Coast and Eastern mills is puzzling, the problem facing firms serving Coast markets entirely from Eastern mills is extremely serious. Heretofore, they have been able to compete favorably with Coast mills by absorbing a portion of the water freight charges, and with Coast basing prices predicated upon water shipment have been able to offer keen competition.

Some Firms Withdraw

Absorption of the added cost of all-rail shipment over that of water freight to meet a Pacific Coast base price would mean virtual elimination of profit or even going deep into the red, depending on the length of rail haul. On the other hand, customers are not anxious to buy f.o.b. Eastern mills and to pay the cost of the rail freight on those products which can be purchased from Coast mills at Coast prices. Eastern mills will have to pay for the privilege of keeping their fingers in the Coast market insofar as products which other firms manufacture on the Coast are concerned if the present pricing setup continues. Some Eastern mills already are finding that the aspirin for this traffic headache consists in withdrawing from the Coast market on such products and devoting themselves to filling orders nearer home which in themselves will assure capacity operation for some time to come.

Although some of their competitors are getting up and going home, the bed left for Coast mills is not one all of roses. If finished steel must be hauled by rail, so must pig iron, manganese and other alloying elements, some refractories, and other production cost factors. As time goes on, mill equipment for replacements will have to be hauled cross-country at machinery rates. Thus, the profit picture is not as bright as it might otherwise be.

The only prospect for keeping the competitive status quo on the Coast lies in the remote possibility of an upward adjustment of Pacific Coast base prices. This is a matter for Washington's consideration.

Dealing in pure speculation, and despite reports that the Kaiser steel proposal has been turned down by the OPM, the time has never been more favorable for far Western steel production schemes. Unfortunately, the earthquakes caused by the withdrawal of intercoastal shipping, has not created any new coking coal deposits.

Aircraft Firm to Build "Fortress"

While nothing but mountains of trouble loomed ahead for steel

COLD DRAWN SHAPES

bright, smooth, accurate—special cold drawn steel sections save machining in countless applications for industrial development and defense.

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS
PITTSBURGH, PENNSYLVANIA

makers, sellers, and users, the aircraft makers last week seemed to be rolling ever faster down the slope into mass production. As a result of conferences of engineering officials of Boeing, Douglas, and Vega, those three aircraft firms last week concluded an agreement by which all three of them will produce the modified Boeing "Flying Fortress" known as the B-17-E. Each of the three will turn out completely assembled 4-engine bombers, identical even to the point of interchangeability of parts. According to the announcement "other manufacturers, even those building pursuit types," will contribute to the program through building parts under sub-contracts.

"Boeing is already starting to furnish blueprints and master templates to the other two firms, and also will furnish them with complete tooling lists and detail drawings of the jigs and tools used in the Seattle factory," the announcement stated.

Boeing announced it would begin construction immediately of an expansion which will bring plant No. 2 of its Stearman division in Wichita, Kansas, to four times its present size. This addition will increase the total floor space of the Boeing companies in Seattle, Wichita, and Vancouver, British Columbia, to 4,815,000 sq. ft.—nearly seven times their area at the start of the defense emergency.

As the new production plan was announced, the War Department gave Boeing its largest single order for Flying Fortress bombers. The contract for $95,242,696 will provide for an estimated 250 planes and bring the Boeing backlog of unfilled orders to $140,000,000.

If Boeing's order was the largest single contract it had received for Flying Fortresses, Consolidated Aircraft Corp. at San Diego could boast the largest single order for airplanes ever placed by the Army. Announced at the same time as the Boeing order, Consolidated's contract is for $226,000,000 for B-24 bombers. Consolidated now has a total backlog of $684,000,000, more than half of which consists of orders received during the last three weeks.

So large is this backlog that company officials are calling for a broadening of the firm's financial structure to handle this tremendous business. A special meeting of stockholders will be called to consider an increase of authorized common stock from 1,200,000 shares to 1,400,000 shares.

An indication of how rapidly the plane program is getting into high gear was given in a Douglas announcement that although working area of the Santa Monica plant expanded only 30 per cent and employment 70 per cent in the past year, production today is nearly tripled. Efficiency of the Douglas mechanized conveyor system is demonstrated by reductions of as much as 50 per cent in the manhours required for certain assembly units according to the company. The firm declared that its Santa Monica plant and the soon to be completed Long Beach factory together will deliver each month more planes than were turned out in any 30-day period last Fall by all United States aircraft factories combined.

Vultee has installed a powered mechanized final assembly line said to increase production of military planes fourfold, with a 50 per cent reduction in final assembly time and a 33 per cent drop in required floor space. Vultee frankly states that this assembly speed up is made possible by the fact that it is working on the largest order placed in number of units for any one type of plane.

Even as mechanization stepped on the throttle of the plane production program labor difficulties threatened to put on the brakes.

Consolidated Aircraft's AFL union representing 14,000 of the 16,000 persons on the payroll, has scheduled a strike vote for Tuesday, June 10.

North American Aviation, Inc., faces a stiff attitude on the part of a CIO union which won bargaining rights by a 70 vote plurality in a labor board election in March.

At San Francisco, a three-day warehouse strike, which closed five steel warehouses among 190 in other lines, has been settled.

Navy requests that uptown San Francisco machine shops work on a six-day week seems probable to run into difficulty through Navy contracts which take into consideration payment of only time and a half for Saturday work. The agreement which famous Machinists' Local No. 68 forced on the shops after a 21-day strike provides for double time pay for Saturday work, and shop owners are loath to make up the difference.

Photo by Wide World

BACK TO WORK: Going through the picket line at the Bethlehem Steel Co. plant in San Francisco, about 3000 workers heeded a back-to-work order issued by the AFL Metal Trades Council. Pickets, members of the AFL Machinists Union silently watch. The West-Coast shipyards strike has been one of the most damaging to U. S. defense.

Fatigue Cracks

BY A.H.DIX

Motor Transport Notes

• • • Nelson A. Rockefeller, who heads the Office for the Coordination of Commercial and Cultural Relations among the American Republics, says that Carmen Miranda, the South American movie star *"can do as much for Pan-American solidarity as a two-ton truck."*

The comparison strikes us as vague. How much can a two-ton truck do for solidarity? Moreover, the statement is ungallant to Miss Miranda, who gets our vote for the favorite movie star to be lost with on a pampas. She rates at least a ten-ton truck, and to give the statement some meaning the C.C.R. Co-ordinator should have added *"full of Argentine beef headed North."*

Mile-Long Monicker

• • • It seems to us that the first thing to do in warming up our southern brothers' love for us is to shorten the name of the committee. Say, for instance, a public-spirited Uruguayan gets a redhot idea for turning the spider web of intercontinental commercial and cultural relations into wire rope. He sits down and prepares a cablegram. Then he counts the words in the address—*"Office for the Coordination of Commercial and Cultural Relations among the American Republics, Washington, D. C."* Fifteen words even without the street address. He figures the cable tolls on the address alone and finds it runs into a pocketful of pesos. This makes him mad; he tears up the cablegram, and relations are worse off than ever.

Blurb

• • • That additional heft you thought you noticed in last week's issue was real. The book had 137 advertising pages, making it the biggest non-special issue since prosperity was just around the corner.

And the family itself is establishing a new high record practically every week now. We, whose eyes used to pop like a deacon's at a burlesque show every time we mentioned a new high, have learned to yawn with you as we recite our triumphs.

Goodwill reigns through the family. The volume of correspondence with readers—always an accurate index of the red corpuscles of reader interest —was never higher. (*N. B. If any problems beset you, call on us. We are, in the vivid language of our form letters, "always glad to be of service."*)

The only tide rips in a sea of satisfaction are the occasional charges of nosiness leveled against the Reader Service Dept. by those few of the brethern whose subscriptions are not yet properly classified. *"Whom are you with and what do you do?,"* we ask them. Some imply that it is none of our d.b., but the fact is that every half year we have to submit a detailed classification of our circulation to the Audit Bureau of Circulations, whose reports are the advertisers' Almanach de Gotha.

In addition, the Research Department punches out your record on one of those Hollerith cards, so that it can survey our circulation nine ways from the ace, for the guidance of both brains and advertising departments. The system is as inhumanly efficient as a phonograph record-changer, and when a card goes through without the necessary classification data, it is like striking a knot with a 59c. plane. These, however, are but flyspecks on a large canvas of contentment, and we are not complaining.

Movie Metallurgy

• • • *At the movies the other night Jack Cosman of the brains department heard a news reel commentator describe a certain new locomotive as being "entirely of high speed steel."* But only, of course, when going very fast.

Squawk

This week's copies of The Iron Age were received late. Many of our men depend for up-to-date information on your current issues and their schedules are completely disrupted when they do not receive them on time.

—From the librarian of one of the industry's larger companies.

Our delivery department, which used to be handled by Jim Farley, has been taken over by a new man, Postmaster General Frank Walker. The service is excellent. And to give ourselves our due, the P.G. gets excellent cooperation from us. Except in the case of the big Annual Number we always meet train schedules and take infinite pains to see that copies are routed to you the quickest way. In some cities off the main lines the train connections are figured as close as a windless July day in St. Louis. An occasional hotbox may therefore mean delay in receiving that week's copy.

If, however, delayed deliveries are chronic we would be glad if you would complain, so that we might ask the Railway Mail Service or your local postmaster to investigate.

Much Ado . . . . .

• • • With so many important things to lose sleep over, A.D.W., who is 5.55 per cent of this page's army of eighteen loyal readers, asks us to campaign against the misuse of the adjective *rugged* in the ads. To fit us for conducting this campaign, he asks us first to look the word up in the dictionary.

We will do no such thing. To us it means *strong, tough, durable.* We are confident that the dictionary would inform us that it means something else and we do not want our illusions shattered. Besides, the dictionary always lags a couple of miles behind the etymological parade. Two or three years from now the dictionary will catch up and will begrudgingly report that *rugged* means what almost everyone now knows it means—*strong, tough, durable.*

Birdman Comes Cropper

• • • As you know, many of the devices that are proving most successful in the present war were originated in this country—the power dive, the airplane itself, the submarine, and Lord knows what else. But what is not so well known is that the glider blitz, as used so spectacularly by the Germans in invading Crete, was developed by your favorite family journal's Detroit editor, author of *"On the Assembly Line"* (see page 70).

The scene was the annual glider meet at Elmira, N. Y., in the year 1937. Among the contestants was our Detroit editor, William F. Sherman, even then no Cassius with lean and hungry look, but nevertheless a skilled glider, and holder of the coveted "birdman" pin for sustained flight.

Like jumping off a 20-story building, the hardest part of gliding is landing. In his flight Bill did well until the end. When he was coming down he saw directly in his path another glider at rest on the ground, minding its own business. With great presence of mind he ran into it full tilt, wrecking it completely, proving the great destructive power of the glider, and now look.

Puzzles

• • • Last week's chipmunk traveled along the hypothenuse of a right triangle. He covered 50.99 ft.

This should take you only five minutes:

By selling a clock for $24 a jeweler made a profit of as many per cent of the cost as the number of dollars the clock cost. What was the cost of the clock?

SCALES That Keep *Secrets*

● Where ingredient proportions are secrets, scales guard confidences by stopping flows automatically when preset weights are reached—*weights known only to the trusted.*

In countless other amazing ways, modern scales aid industry. They *count* small parts and products. They weigh while materials are *on the move.* They *print* records and receipts, *add* weights and record totals, and sometimes perform their bookkeeping *in distant offices.*

It is possible that Fairbanks-Morse Scale engineers could point out unsuspected but profitable applications of modern scales in *your* plant, as they have done in thousands of others. Their knowledge and experience are at your service in solving any weighing problem. Write Fairbanks, Morse & Co., Dept. F-38 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the U. S. and Canada.

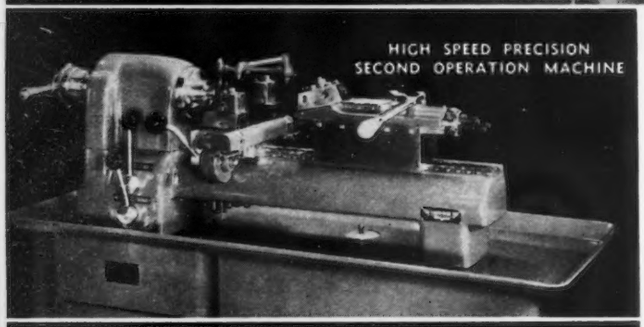
The application of Fairbanks Scales to weighing problems is vastly extended by the use of photoelectric cells, automatic printing devices, limit switches, and other electric control mechanisms.

FAIRBANKS·MORSE SCALES

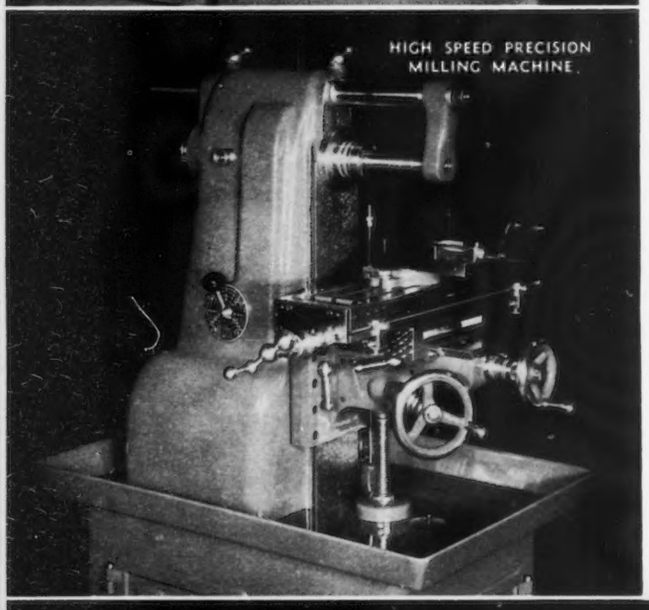
DIESEL ENGINES ELECTRICAL MACHINERY RAILROAD EQUIPMENT WASHERS-IRONERS STOKERS
PUMPS MOTORS WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS

HARDINGE

HIGH SPEED
PRECISION LATHE



HIGH SPEED PRECISION
SECOND OPERATION MACHINE



HIGH SPEED PRECISION
MILLING MACHINE

WORTH REMEMBERING

(No. 1 OF A SERIES)

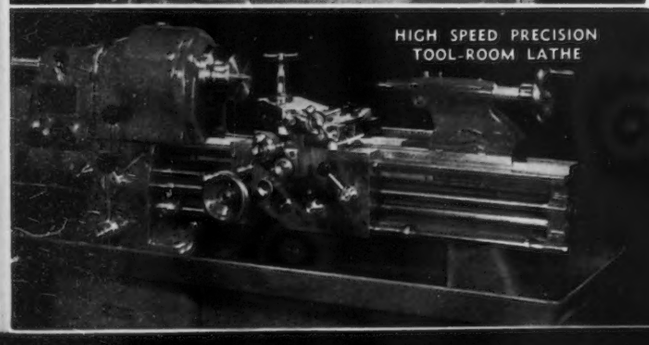
Today's extremely close tolerances and the requirement for high speed production have shown the real value of Hardinge High Speed Precision Machine Tools.

The use of the machines illustrated has expanded tremendously because of their ability to do, BETTER and FASTER, the work which was formerly done with larger machines.

Efficiency is essential in the present emergency because of needed production, but isn't it true, when costs and results are considered, that efficiency in machining operations is always important?

Many organizations were acquainted with the features of the Hardinge High Speed Precision Machine Tools and many were not. But, most organizations NOW realize the logic of using the proper size machine in relation to the work.

For the future, make certain that your range of production work is always efficiently manufactured—such a plan should incorporate Hardinge High Speed Precision Machine Tools.



HIGH SPEED PRECISION
TOOL-ROOM LATHE

HARDINGE BROTHERS, INC.

ELMIRA, N. Y.

"Performance has established leadership for Hardinge"

News of Industry

Weir's Resignation From Institute Is Laid To Wage Dispute

Pittsburgh

• • • **Ernest T. Weir,** board chairman, National Steel Corp., last week resigned his directorship in the American Iron and Steel Institute and also withdrew his company from membership. No announcement has been made that the resignation has been accepted. It was indicated that the resignation has been received and will be submitted to the institute's board of directors for consideration at its next meeting.

Mr. Weir's move is believed to have been the culmination of criticism within the steel industry directed against him for dramatically increasing steel wages 10c. an hour and also stating that no move to change steel prices should be made until final figures on second quarter earnings were determined.

Neither Mr. Weir nor other officials in the steel industry have made any public comment on the resignation and withdrawal.

Mr. Weir's announcement of a 10c. wage increase, which he declared the workmen were entitled to inasmuch as they had not received increased hourly rates for four years, came at a time when the U. S. Steel Corp. and the SWOC were deadlocked in their negotiation. The corporation had agreed to a 5c. an hr. wage increase and it is understood the union itself would have settled for 8c. an hr.

In one of his recent press conferences, Mr. Weir stated that a steel industry official had said the National Steel Corp.'s increase of 10c. an hr. would bring about uncontrolled inflation which Mr. Weir answered by saying he didn't see how the difference between 5c. an hr. which some steel companies had been willing to give, and the 10c. an hr. which his company granted, could bring about "uncontrolled inflation."

Mr. Weir was the last of the institute's presidents to serve on an honorary basis and in May, 1940, Walter S. Tower, who had formerly been the institute's executive secretary, was placed on a full time salaried basis as president.

T. C. & I. and Koppers Buy Blast Furnaces

Birmingham

• • • **The purchase of a blast** furnace near Holt, Ala., from Central Iron Liquidating Corp., was announced by Robert Gregg, president of Tennessee Coal, Iron & Railroad Co., a subsidiary of U. S. Steel Corp. Built in 1903, the furnace was last operated in 1929.

Production, rated at 325 tons of foundry iron per day, will begin as soon as the furnace can be made ready, estimated by engineers to be within 90 days. An operating force of nearly 250 men will be recruited from Holt and towns in the vicinity, while supervisory and highly skilled personnel will be supplied from the company's forces at Ensley and Fairfield.

"Growing demands of the national defense program," Mr. Gregg said, "have made it necessary for us to increase our pig iron production, which we are doing by bringing the Holt furnace into production."

LEAVES INSTITUTE: Ernest T. Weir (above), chairman of National Steel Corp. has withdrawn himself as director and his company from membership in the American Iron and Steel Institute.

New York

• • • **Details of the sale** of the Granite City Pig Iron Co. plant at East St. Louis to Koppers United Co. were revealed this week.

Koppers United Co. paid $650,000 for the property, $388,520 of which will be used to pay off the issue of bonds of Granite City Pig Iron Co.

The newly acquired plant has two blast furnaces, rated at 33,000 tons per month, which have been idle since 1931. Koppers announced that operations will be resumed almost immediately with one furnace, while the second one will be ready for production within a few weeks.

Coke for the first furnace will be supplied by Laclede Gas Light Co., St. Louis, and ore will be obtained principally from the Lake District.

Censorship Placed On Navy Contracts

• • • The Navy Department last week clamped down a rigid censorship on Navy contracts, announcing that henceforth information will not be made available on Navy orders placed with individual contractors.

Only persons having "legitimate business" with the department will have access to future contract information, the department said. Such information may be obtained direct from the bureau issuing the contract.

TORPEDO HEAD AND SHELL: Hand on a torpedo head, William S. Knudsen, OPM director general, is shown with Philip Reed, consultant to the OPM Priorities Division at the recent N.A.P.A. Convention in Chicago. (The smaller object is a shell).

Michigan CIO Union Bars Communist, Fascist Officials

Detroit

• • • **After heated debate, the Michigan** Industrial Union Council (CIO) went on record, by a three to one vote, at its state convention as opposed to election or appointment of Communists, Nazis, or Fascists to CIO offices. This is the strongest stand against Communists ever taken by the CIO in Michigan.

Chicago OPM Has Consultant For Firms Seeking Arms Orders

Chicago

• • • **An engineering consulting** service for the benefit of purchasing agents seeking defense contracts has been established here by the Defense Contract Service of the local OPM office. An experienced staff engineer is available for consultation on Monday, Wednesday and Friday of each week from 9.30 to 10.30 a. m.

British Plants Turn More To Armament

London

• • • **Production in the** heavy industries is increasingly for armament and other government purposes, and the works continue at peak rates of operation. The basic branches engaged on pig iron and steel are turning out exceedingly heavy tonnages, and, notwithstanding the widening range of products in manufacture by the finishing branches, steel deliveries on many government orders are ahead of schedule time. This may not continue to be the case as still more finishing units come into operation, but meanwhile the prospect of satisfying requirements is good, for flow of materials remains encouraging as regards all classes save, perhaps, malleable iron scrap. In addition to domestic production, of course, supplies of all classes of scrap, pig iron and semi and finished steel are arriving from abroad in heavy quantities.

Welsh tin plate manufacturers are wondering whether the recent extension of the restrictions placed on the use of uneconomic and non-essential tin plate containers by the Minister of Supply will mean, after all, an additional annual saving of from 30,000 to 40,000 tons of tin plate, as was at first expected. This view is based principally on the fact that the amount of steel at present being allocated to the industry remains substantially the same. Compared with the March figures, makers are actually receiving about 15 per cent more steel.

Another important point is the numerous orders now being put through the Ministry of Supply for the canning of fruit, milk and vegetables. The general feeling is, therefore, that the order aims primarily at concentrating available steel supplies on essential products rather than on non-essentials.

War conditions and the cutting off of certain supplies of iron ore have led to some important developments in the technique of manufacture. One feature is the greater use of domestic ore in the blast furnaces. From this ore, although it is of lower grade than some of that imported, blast furnace operators are turning out useful amounts of pig iron, thus saving shipping tonnage which would otherwise be required for imports. In the use of the low-grade ore, however, the admixture of certain qualities of ore from abroad is needed. In making steel also full use is being made of the scrap which is being collected in large quantities all over the United Kingdom, while metal turnings from munition factories are available for the iron and steel trades.

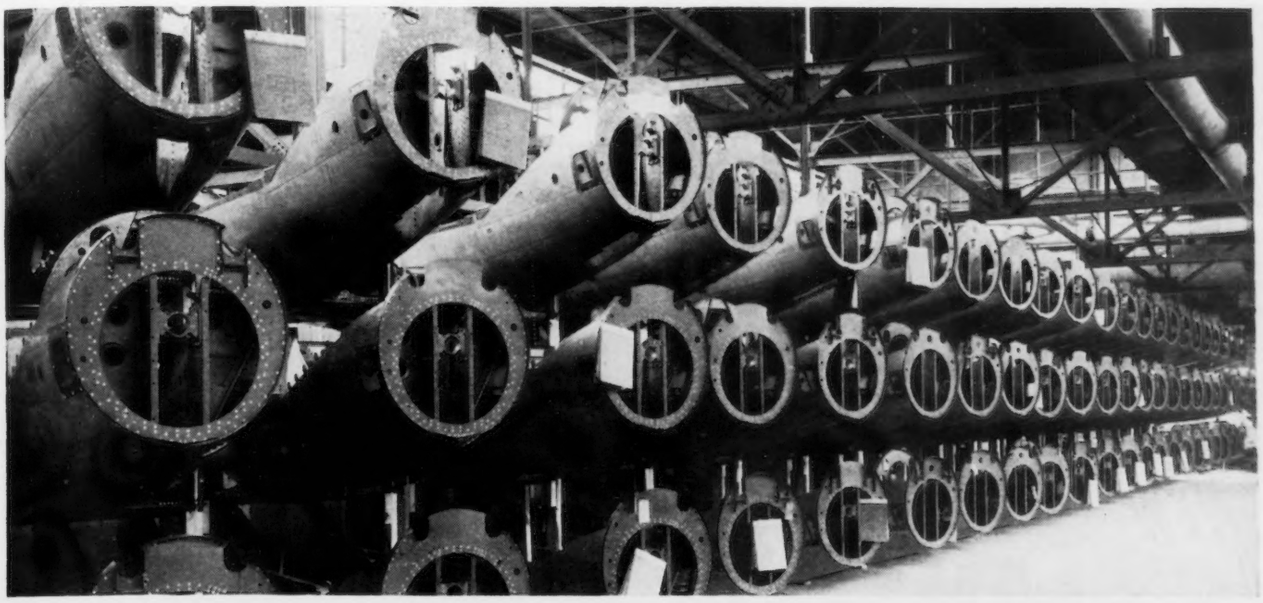
Coming Events

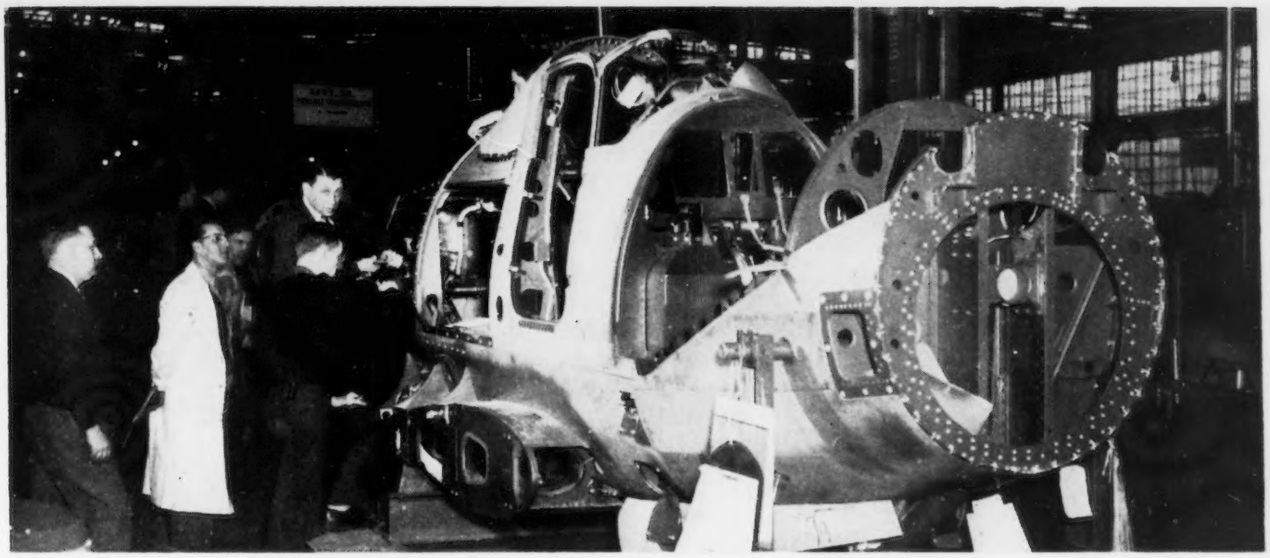
June 23 to 27—American Society for Testing Materials, annual meeting, Chicago.

Sept. 23 to 26—Iron and Steel Engineers, annual convention and exposition, Cleveland.

Photo by Harris & Ewing

40 BILLIONS NOT ENOUGH: Stacy May, chief of the OPM Bureau of Research and Statistics, last week told a Senate committee that the $40,000,000,000 defense program is "far too low" compared with other nations. Steel capacity in the U. S., is also far too low, Mr. May believes.





COBRAS OF THE AIR: How American plants are getting into large-scale production of warplanes is shown in these photographs taken at the Bell Aircraft Corp.'s Elmwood Avenue plant at Buffalo. At the top are fuselage sub-assemblies of P-39 Aircobras. The center photo shows a fuselage already looking like an airplane while the bottom picture shows one of two final assembly lines at the Bell plant.

Studebaker and Muncie Foundry Co., Sign New Pacts With UAW

South Bend, Ind.

• • • **A wage increase** of 8c. an hour has been granted 8000 workers of the Studebaker Corp., members of Studebaker Local No. 5, United Automobile Workers (CIO). No work stoppage occurred during negotiations.

After four weeks' negotiations between the United Automobile Workers and Muncie Foundry Co., Muncie, Ind., a general wage increase of 5c. an hour for all mechanical employees and piece workers, one week vacation with pay, and a flat vacation salary of $25 and an $8 per day guarantee to molders and coremakers were included in a new labor contract. Muncie Foundry Co. is a division of Borg-Warner Corp.

Europe's Steel Orders Clear Through Berlin

London

• • • **According to the latest** information from the continent, the number of blast furnaces in operation in Belgium at the end of 1940 was 23, compared with 44 at the end of 1939.

Belgian steelworks are required to export to the Netherlands, Denmark, Norway and Finland a total quantity of 300,000 tons of steel per month. Payments are being made for these shipments through the Central Clearing Office, Berlin.

Belgium's coal output remains considerably below the requirements of the industry owing to a further decline in the number of available miners.

R. W. Dietrich Presides at Annual Party of Baltimore Steel Club

Baltimore

• • • **The Steel Club** of Baltimore held its sixth annual golf party and dinner on June 6 at the Baltimore Country Club. R. Walter Dietrich of Rustless Iron & Steel Corp., the newly elected president of the Steel Club, presided at the dinner. More than 200 members and guests attended.

Photo by International

GRINDING A CRANKSHAFT: Protected by a nose guard and face shield, this G-M worker is grinding an Allison aircraft engine crankshaft.

Swedish Steel Plant Pays 8% Dividend

London

• • • **The net profit** for 1940 of the Sandvik Steelmills, Swedish iron and steel manufacturing concern, was kr. 3,700,000 (approximately $872,000), or kr. 1,000,000 more than for 1939. The dividend of 8 per cent is being maintained and shareholders are to receive one bonus share for every four held. kr. 5,000,000 of the reserves being capitalized and the capital raised from kr. 20,000,000 to kr. 25,000,000.

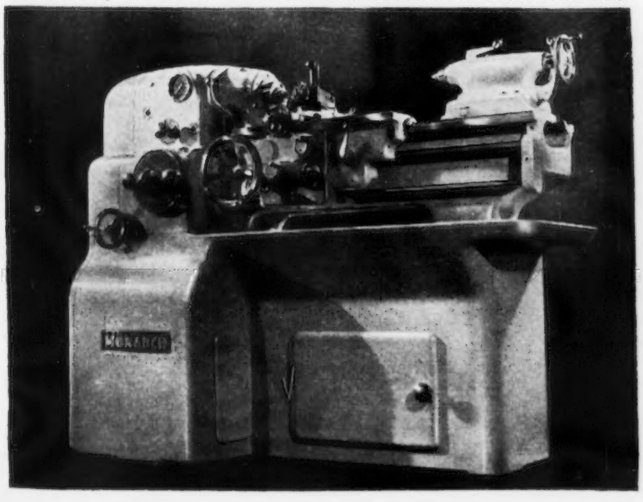
8717 Employed at Government Arsenal at Rock Island, Ill.

Rock Island, Ill.

• • • **The government arsenal** here added only 24 workers during May, dropping 265 WPA employees. Not including 176 employees provided by WPA, the total number on the payroll now amounts to 8717.

THIS IS NO TIME FOR A PATCH!

Monarch's Up-To-The-Minute 10"x20" Sensitive Precision Tool Maker's Lathe.



YESTERDAY it was considered "modern practice" to buy an occasional machine tool in order to fill in a gap or extend a production line.

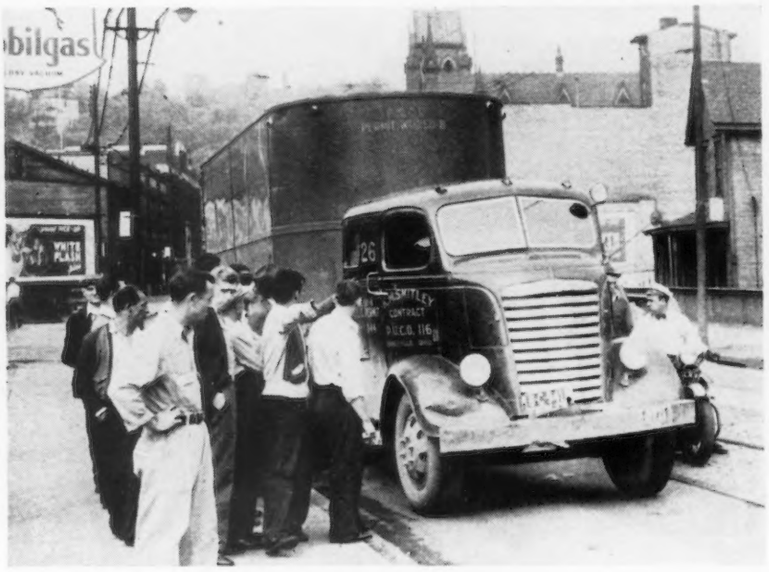
Under ordinary conditions this method of "patching" served temporary needs, but it left no margin of production reserve for such times of emergency as face industry today, and will face it tomorrow!

In times like these, hand-to-mouth buying is fatal. Protect yourself against the eventualities of tomorrow's peacetime or wartime production demands with modern Monarch Lathes that have been designed to meet tomorrow's high-speed production requirements. The Monarch Machine Tool Company, Sidney, Ohio.

MONARCH LATHES

PRESIDENT ROOSEVELT said, on May 27: "The overwhelming majority of our citizens expect their government to see that the tools of defense are built; and for the very purpose of preserving the democratic safeguards of both labor and management this government is determined to use all of its power to express the will of its people, and to prevent interference with the production of materials essential to our national security." — NEVERTHELESS

ON JUNE 2—Roving bands of striking (AFL) truck drivers demanding 10c. and 15c. wage increases forced all trucks on Pittsburgh streets, including those carrying defense material, to pull up in parking lots and garages.



ON JUNE 4—Workers at Great Lakes Steel Corp.'s plant at Ecorse, Mich., went on strike without knowledge of SWOC leaders and while negotiations with the management were being carried on.

ON JUNE 9—The President directed the Army to take over the struck North American Co. plant at Inglewood, Cal.

TESTING *Standard's* PRODUCTS FOR YOUR PROTECTION

Southwark-Tate-Emery Universal Testing Machine in the testing laboratory of Standard Steel Works, Burnham, Penna.

The materials going into Standard's forgings and castings are under the constant supervision of trained metallurgists. Their job is to safeguard the quality built into every part delivered to our customers.

A complete, modern testing laboratory is constantly engaged in research and routine tests for your protection.

Add trained shop personnel and up-to-date manufacturing equipment and you have the story behind the satisfactory service of materials made by Standard.

BLW THE BALDWIN GROUP

STANDARD STEEL WORKS

Division of THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

Other Members of the Baldwin Group • THE BALDWIN LOCOMOTIVE WORKS
BALDWIN SOUTHWARK DIVISION • THE PELTON WATER WHEEL COMPANY
BALDWIN DE LA VERGNE SALES CORP. • THE WHITCOMB LOCOMOTIVE COMPANY
THE MIDVALE COMPANY • CRAMP BRASS AND IRON FOUNDRIES DIVISION

IBM Book on Precision Measurement Now Available

• • • **In order to assist** defense industries in the training of inspectors and the upgrading of tool, die, and instrument makers, the Bureau of Industrial and Technical Education of the New York State Education Department has made available a text dealing with the use of precision instruments. This has been possible through the cooperation of the International Business Machines Corp. in releasing for reprinting the extensive material developed in their plant training school. The title of this textbook is "Precision Measurement in the Metal Working Industry." This material has recently been reviewed and revised by the United States Bureau of Standards, and is regarded as one of the outstanding publications in this field.

The book is illustrated and consists of 12 chapters, totaling 496 pages. All types of gages, comparators, surface measuring instruments and hardness testers are discussed. Single copies at $3 ($2.50 for 25 or more) may be obtained from Roy F. Jhncox, secretary, N. Y. State Vocational and Practical Arts Association, 2 Saratoga Avenue, Rochester, N. Y.

Studies Reveal 150,000 Ton Chrome Reserve in Alaska

• • • **Chromite deposits** on Kenai Peninsula, Alaska, have been known for more than 30 years but only recently studies revealed that reserves amounted to 150,000 tons, 70,000 tons of which is shipping grade. Much of this ore is accessible by water.

BLACKOUT LIGHTING: For industrial plants and for other users, General Electric Co. has designed a new argon lamp which gives off both visible and invisible light. Ultraviolet rays may be made visible by using fluorescent paint on signs or in roadways, making them visible to the worker or pedestrian but not to the fighter plane aloft.

Photo by International

Menzies Praises Steel Leaders' Part in War

London

• • • **Prime Minister R. G. Menzies** of Australia was the guest of honor at the luncheon of the British Iron and Steel Institute which was held in London early in May. John Craig presided and the Bessemer Gold Medal for 1941 was presented to Dr. Thomas Swinden.

"This is a war in which the factory and organization of the machine are more important than at any time in the world's history," Premier Menzies declared. "Calculations about man-power must be abandoned, and we must estimate our strength on industrial power translated into machines of war.

"**The work which is** being done by the heavy industries is so vital that I am not sure that everybody in the iron and steel industry should not be regarded as being on active service, and that your president should not be made a general as an outward sign of recognition of your work, and of the fact that you have gone to war.

"When I was in England some years ago friends in the iron and steel industry praised the agricultural products of Australia, but asked why we, with our small population, should want to embark on iron and steel production, which could well be left to the United Kingdom. During the last few weeks I have had many a grim recollection of that attitude.

"The Mother Country could not now be progressing as she is in all forms of engineering production for war were it not for the iron and steel industry of Australia. Never a week goes by but I do not express my gratitude for the wisdom of those who built up firmly and broadly the foundations of the heavy industries in Australia."

FOR GERMAN SKIES: These women workers in a Canadian plant are welding cases for parachute flares destined to light up German skies and help locate targets for the Empire's bombers.

Photo by British-Combine

Points to Steel Saving By Welded Construction

Cleveland

• • • **Appreciable savings in steel,** through elimination of overlapping joints and through use of lighter gages, can be made by arc welding, according to A. F. Davis, vice-president of Lincoln Electric Co. here.

The subject is particularly timely at this time because of the possibility steel plate mills might become overtaxed by demands of the defense program, or in any event find their entire capacity required for armament over a long period, says Mr. Davis. The huge shipbuilding program is only one factor in the demand for plates. Railroads indicate they will need large numbers of new cars, in which plates are used heavily, while demand from makers of roadbuilding equipment, tanks, boilers, building construction and other fields, will increase. Due to the requirements of the defense program many owners of machinery and equipment will find it advisable to use arc welding for repairs instead of waiting for new parts.

Steel savings with welding stem from the fact that extra metal required for connecting members in the riveted structure are eliminated with welded production. Moreover, since the steel is not weakened by rivet holes, a further saving is effected by obtaining equal strength with lighter, and, therefore, less steel.

Figures just released by the James F. Lincoln Arc Welding Foundation show that an average of 18 per cent less steel is required to build the welded product or structure than the same one riveted. On this basis, production for national defense would have 360 lb. more usable material in every ton of steel. Applied to the nation's annual ingot capacity of 82,000,000 tons, this would conserve 2½ months' production each year.

The actual percentage of steel savings in the foundation's 14 case examples, which were taken at random from industrial reports, range from 9 per cent on a field service truck body and freight car underframe up to 45 per cent on a scroll case for a turbine. On the 10,490-lb. freight car underframe, for example, welded construction saved 1020 lb., or sufficient to produce one *extra* underframe for every 10 frames produced.

On this same basis, sufficient steel would be saved to build one extra locomotive frame for each four produced, one locomotive boiler for each 10 built, one carfloat for each six constructed and one aircraft beaching gear for every five manufactured.

Tin Smelter to be Built; 4000 Tons of Ore Await Completion

Texas City, Tex.

• • • **Four thousand tons of tin ore** recently unloaded at this port from Bolivia await construction of the $3,500,000 tin smelter to be built by the Tin Processing Co., New York. Other ore shipments from African and Antofagasta ports will be stored here pending completion of the smelter.

STEEL SAVED BY WELDED STEEL CONSTRUCTION—ACTUAL EXAMPLES

	Material Weights—Pounds			
Product or Structure	*Former Method*	*Welded*	*Saved by Welding*	*Per Cent Weight Saved*
Truck bodies	2,158	1,958	200	9
House trailer	2,920	2,174	746	25
Locomotive frame	24,769	17,942	6,827	27
Locomotive boiler	110 278	99,318	10,960	10
Barge	565,000	500,000	65,000	11
Car float	1,976,290	1,666,860	309,430	15
Five-span girder bridge	1,597,088	1,175,563	421,525	26
Elevator	21,706	13,300	8,406	38
Beaching gear for large aircraft	17,610	14,258	3,352	19
Trailerized tank	7,640	6,580	1,090	14
Freight car underframe	10,490	9,470	1,020	9
Passenger coach frame	94,000	65,000	29,000	30
Highway bridge	438,684	419.560	19,124	43
Scroll case for turbine	391,640	214,830	176,810	42
Truck winch	808	608	200	24
Mobile paving plant	33,365	29,402	3,963	11

Government Awards . . .

Navy Dept., Bureau of Supplies and Accounts:

American Art Metals Co., Inc., Atlanta, Ga.; trucks, racks, conveyors and stands $30,424
American Brass Co., Waterbury, Conn.; bronze, aluminum, rod, round 5,175
American Rolling Mill Co., Middletown, Ohio; steel, sheet 13,037
American Smelting & Refining Co., New York; lead, pig, grade B. 53,100
Anaconda Wire & Cable Co., New York; cable, electric 353,680
Arma Corp., Brooklyn; ordnance 1,992,060
Baldt Anchor Chain & Forge Co., Chester, Pa.; anchors, special, stockless 14,640
Behr-Manning Corp., Troy, N. Y.; cloth, abrasive, aluminum oxide sheet and paper, garnet, roll and sheet 105,295
Camden Forge Co., Camden, N. J.; steel, bar 65,795
Carnegie - Illinois Steel Corp., Washington; steel, sheet 33,293
Collyer Insulated Wire Co., Pawtucket, R. I.; cable, electric .. 362,518
Columbia Steel Co., San Francisco; steel, sheet 64,852
Columbia Steel & Shafting Co., Pittsburgh; steel, bar 61,267
Columbian Steel Tank Co., Kansas City, Mo.; buoys, cylindrical 192,617
Crucible Steel Co. of America, New York; steel, sheet 29,573
Easton Car & Construction Co., Easton, Pa.; trucks, electric .. 11,895
Edison General Electric Appliance Co., Inc., Chicago; ranges, griddles, kettles and ovens 152,939
Ford Instrument Co., Inc., Long Island City, N. Y.; parts for torpedo directors 60,818
Franklin Bronze & Aluminum Co., Franklin, Pa.; bronze, journal shells, round 6,800
General Cable Corp., Washington; cable 1,105,530
General Electric Co., Washington; cable, electric ..... 709,9_7
General Motors Corp., Cleveland Diesel Engine Division, Cleveland; exhaust valve 9,282
G. A. Gray Co., Cincinnati; planers, housing 103,924
Graybar Electric Co., Inc., Washington; clips, wire rope 10,321
R. W. Greeff & Co., Inc., New York; magnesium, flat shavings 22,875
Hamilton Watch Co., Lancaster, Pa.; watches, chronometer complete 68,516
Indestro Mfg. Corp., Chicago; wrenches, engineers' and sockets 26,664
International Nickel Co., Inc., New York; ordnance 2,465,845
Kearney & Trecker Corp., Milwaukee; machine, milling, universal, motor driven 7,835
Kilby Steel Co., Anniston, Ala.; cutters, star 229,476
Lionel Corp., New York; binnacles, compensating 167,900
Logan Iron & Steel Co., Burnham, Pa.; iron, wrought bar 9,490
Maxim Silencer Co., Hartford; mufflers, exhaust 5,024
Midvale Co., Nicetown, Philadelphia; steel bar 9,751
Minnesota Mining & Mfg. Co., St. Paul; cloth, abrasive, aluminum oxide sheet and paper, flint ... 18,714
National Tube Co., Washington; flasks, steel, type A 14,120
Okonite Co., Passaic, N. J.; cable, electric 350,291
Otis Steel Co., Cleveland; steel, sheet 16,343
Phelps Dodge Copper Products, Habirshaw Cable & Wire Div., New York; cable, electric 353,847
Phosphor Bronze Smelting Co., Philadelphia; bronze, phosphor, bar 39,519
Riverside Metal Co., Riverside, N. J.; bronze, phosphor bar, round 14,716
Seymour Mfg. Co., Seymour, Conn.; bronze, phosphor bar, round; and spring, sheet 6,768

Star Electric Motor Co., Bloomfield, N. J.; sets, motor generators 408,046
U. S. Motors Corp., Oshkosh, Wis.; generators, electric and spare parts 25,146
Universal Gear Corp., Indianapolis, Ind.; dynamometer 15,010
Vulcan Soot Blower Corp., Du Bois, Pa.; units, soot blower and spare parts 17,145
Weirton Steel Co., Weirton, W. Va.; steel, sheet 208,588
Wheeling Steel Corp., Wheeling, W. Va.; steel sheet 38,188

War Dept., Ordnance:

Ahlberg Bearing Co., Chicago; ball bearings $12,240
Ajax Electrothermic Corp., Trenton, N. J.; furnaces and equipment, generating 489,700
American Gas Furnace Co., Elizabeth, N. J.; furnaces 7,700
Arcade Malleable Iron Co., Worcester, Mass.; castings 15,611
Athey Truss Wheel Co., Chicago; trailers 5,346
Auto Specialties Mfg. Co., St. Joseph, Mich.; development of rough machined cast steel shell bodies 16,500

Bausch & Lomb Optical Co., Rochester; equipment, gage ... 4,014
Bonney Forge & Tool Works, Allentown, Pa.; forgings 57,330
Brown & Sharpe Mfg. Co., Providence; machines, screw 41,485
A. Brozyna Mfg. Co., Newark; pins, set back 16,400
Budd Wheel Co., Detroit; cores, armor piercing 55,000
Buhl Stamping Co., Detroit; mines 232,000
Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.; ammunition parts 17,100
Caterpillar Tractor Co., Peoria, Ill.; tractor 5,262
Cincinnati Centerless Grinding Corp., Cincinnati; grinders, centerless 15,849
Cleveland Container Co., Philadelphia; containers 123,900
Cleveland Tractor Co., Cleveland; parts for tractors 49,640
Colonial Broach Co., Detroit; machines, horizontal broaching .. 16,005
Colt's Patent Fire Arms Mfg. Co., Hartford; gun components ... 15,340
Consolidated Packaging Machinery Corp., Buffalo; machines, taping 7,460
Continental Motors Corp., Muskegon, Mich.; engines 76,340
parts for tanks 25,688
Crucible Steel Co. of America, Pittsburgh; steel 4,730
Eaton Mfg. Co., Wilcox-Rich Division, Detroit; valves 13,270
Electric Service Supplies Co., Philadelphia; blocks, vee 6,138
Electro Dynamic Works, Bayonne, N. J.; motors 15,234
Faultless Caster Corp., Evansville, Ind.; fuze 331,500
Fox Munitions Corp., Philadelphia; gages 20,303
Gar Wood Industries, Inc., Detroit; parts for winch, heavy tractor 32,662
General Motors Corp., Delco-Remy Division, Anderson, Ind.; generators and regulators 17,326
General Motors Corp., New Departure Division, Bristol, Conn.; ball bearings 32,989
General Time Instruments Corp., Seth Thomas Clock Division, Thomaston, Conn.; bushings and collars 7,835
Thomas B. Gibbs Co., Ind., Delavan, Wis.; equipment, dynamic regulator 64,796
Glascock Brothers Mfg. Co., Muncie, Ind.; mines 246,000
Hadley Special Tool Co., Inc., Boston; gages 20,791
Harrisburg Steel Corp., Harrisburg, Pa.; ammunition parts 5,852
Hummel & Downing Co., Milwaukee, Wis.; discs, spotter, target 34,105
F. L. Jacobs Co., Detroit; fuze parts 436,840
Walter Kidde & Co., Inc., New York; fire extinguishers 23,718
Kingston Products Co., Kokomo, Ind.; fuze 330,000
Krebs Mfg. & Engineering Co., Chicago; ammunition parts ... 7,650
Laminated Shim Co., Inc., Glenbrook, Conn.; shims, laminated. 4,543
Letts Drop Forge, Inc., Detroit; forgings 6,377
Lincoln Engineering Co., St. Louis, Mo.; adapters, hose and guns, lubricating 14,152
Midvale Co., Nicetown, Philadelphia; forgings 27,195
Mid-West Forge Co., Cleveland; blanks, barrel 7,625
Motor Wheel Corp., Lansing, Mich.; shells 307,650
Mount Die-Sinking Co., Hartford; dies, forgings and resinkings .. 12,400
Mueller Brass Co., Port Huron, Mich.; boosters 56,595
National Wire Co., Pittsburgh; cable, electric 4,733

Niles-Bement-Pond Co., Pratt & Whitney Division, West Hartford; gages 48,317
Noblitt-Sparks Industries, Inc., Columbus, Ind.; mines 244,000
Package Machinery Co., Springfield, Mass.; machines, cartridge loading 13,600
Parker Stamp Works, Inc., Hartford; dies, forging, and resinkings 9,600
Parsons Co., Detroit; mines, practice 154,000
Peco Mfg. Co., Philadelphia; screws 65,550
Phoenix Mfg. Co., Catasauqua, Pa.; forgings 9,223
Pipe Machinery Co., Cleveland; gages 8,069
Precision Mfg. Co., New York; gages 42,545
Rahaim Machine & Tool Co., Boston; gages 4,223
Raymond Concrete Pile Co., New York; steel shell concrete filled piles 11,891
Reliance Machine & Tool Co., Pottstown, Pa.; lathes, chamber boring 44,400
Remington Arms Co., Bridgeport, Conn.; cartridges 262,562
Republic Steel Corp., Warren, Ohio; cases, cartridge 13,564
Robinson Mfg. Co., Muncy, Pa.; machines, screening 12,740
Ryerson & Haynes, Inc., Jackson, Mich.; mines 253,750
Saginaw Stamping & Tool Co., Saginaw, Mich.; trailers 614,553
Schutte & Koerting Co., Philadelphia; machines, tilting-tumbling 8,800
Sheffield Corp., Dayton, Ohio; gages 53,948
Somerville Machine & Foundry Co., Somerville, Mass.; castings 9,648
Thompson Products, Inc., Detroit; adapters 146,000
Timken-Detroit Axle Co., Wisconsin Axle Division, Oshkosh, Wis.; parts and kits to convert tank transmissions 51,490
parts for tanks 20,632
Tools and Gages, Inc., Cleveland; gages 3,744
University of Michigan, Dept. of Engineering Research, Ann Arbor, Mich.; testing device 10,000
Veit & Young, Philadelphia; dies. 125,340
Vulcan Crucible Steel Co., Aliquippa, Pa.; steel, tool 8,246
Wallace Supplies Mfg. Co., Chicago; manifolds, exhaust 50,877
Warner Electric Brake Mfg. Co., Beloit, Wis.; brake parts 10,444
S. K. Wellman Co., Cleveland; rivets and facings, clutch 5,387
Weldon Tool Co., Cleveland; cutters 6,384
Western Cartridge Co., East Alton, Ill.; cartridges 48,092
Western Cartridge Co., Winchester Repeating Arms Division, New Haven, Conn.; cylinders .. 6,900
Westinghouse Electric & Mfg. Co., Westinghouse X-Ray Division, Long Island City, N. Y.; equipment, X-Ray, photographic ... 55,000
White Motor Co., Cleveland; parts for cars 15,726
Wilmington Experimental Station, Wilmington, Del.; machines, primer mixing 22,500
York Safe & Lock Co., York, Pa.; parts for gun mounts 44,441
wrenches 5,005

War Dept., Air Corps:

Air Associates, Inc., Bendix, N. J.; aircraft mfg. facilities $311,706
aircraft mooring kits 142,875
compass assys. 52,080
Air Cruisers, Inc., Clifton, N. J.; assys. 64,000
Aircraft Hardware Mfg. Co., Inc., New York; eye, fork, sleeve cable terminals 15,966

American Chain & Cable Co., Inc., Wilkes-Barre, Pa.; cable, extra flexible 137,225
American Steel & Wire Co., Columbus, Ohio; cable, extra flexible 51,331
Bendix Aviation Corp., Bendix Products Division, South Bend, Ind.; carburetor assys. 1,344,935
Bendix Aviation Corp., Eclipse Aviation Division, Bendix, N. J.; starter, switch and solenoid assys. 1,131,700
Bendix Aviation Corp., Pioneer Instrument Division, Bendix, N. J.; compass assys. 52,080

Bunell Machine & Tool Co., Cleveland; crankshaft spline and thrust bearing nut 100,719
Chicago Pneumatic Tool Co., Detroit; hammers 124,475
Chrysler Corp., Detroit; fuselage sections 5,336,835
Crescent Insulated Wire & Cable Co., Inc., Trenton, N. J.; cable 147,283
Curtiss-Wright Corp., Airplane Division, Buffalo; maintenance parts 1,581,180
airplanes and spare parts 32,255,858
Edgewater Steel Co., Pittsburgh; adapter assys. 39,167

General Motors Corp., Delco Products Division, Dayton, Ohio; motor assys.	84,000
General Motors Corp., Delco-Remy Division, Anderson, Ind.; assys.	393,800
Hamilton Metal Products Co., Hamilton, Ohio; tool kits	24,570
Heil Co., Milwaukee; trucks, oil servicing; trailers, semi, tanks; dollies, trailer converter	5,363,489
Kennedy Mfg. Co., Van Wert, Ohio; tool kits	76,558
King Sealey Corp., Ann Arbor, Mich.; eliminators and valves, air vapor control	26,467
Leece - Neville Co., Cleveland; assys.	220,000
Lockheed Aircraft Corp., Burbank, Cal.; airplanes and spare parts	47,769,196
Mall Tool Co., Chicago; electric drills	62,832
Fred Medart Mfg. Co., St. Louis, Mo.; steel shelving	17,992
Nichols Electric Co., Dayton, Ohio; cable	322,365
Rochester Ropes, Inc., Jamaica, N. Y.; cable, extra flexible	9,860
John A. Roebling's Sons Co., Trenton, N. J.; cable, extra flexible	61,256
Sperry Gyroscope Co., Inc., Brooklyn; control assys. and hydraulic controls	78,898
Square D Co., Kollsman Instrument Division, Elmhurst, N. Y.; parts for tachometer indicators and generators	83,789
Harold E. Trent Co., Philadelphia; furnaces, electric	53,280
Weston Electric Instrument Corp., Newark; indicator and general tachometers	.....
Wright Aeronautical Corp., Paterson, N. J.; maintenance parts, engines	514,755

War Dept., Other Agencies:

American Bantam Car Co., Butler, Pa.; trucks, ¼ ton	$864,141
American Sterilizer Co., Erie, Pa.; sterilizing outfits	4,746
Baldwin Laboratories, Inc., Franklin, Pa.; outlet valve guards	7,239
Diamond T, Chicago; trucks, 4 ton, and wreckers	3,717,966

FRYING PANS TAKE OFF: Shown pans collected from different official: "The pots and pans which for aluminum are now in the air smashing enemy territories." Piles the U. S. sometime will look like

AWARDS

Dohrmann Hotel Supply Co., Seattle; kitchen equipment	8,686
Chase Brass & Copper Co., Inc., Waterbury, Conn.; brass, sheet and round	12,772
Continental Can Co., New York; equipment for mfg. canisters	48,295
Florida Pipe & Supply Co., Inc., Jacksonville, Fla.; black, steel pipe	5,987
Ford Motor Co., Dearborn, Mich.; trucks, ¼ ton	865,700
General Motors Corp., Chevrolet Division, Detroit; trucks, 1½ ton	27,107
Hughes Range Co., Tacoma, Wash.; oil fired kitchen ranges	9,609
A. Kreamer, Inc., Brooklyn; measure, tin, lipped	16,956
Lalance & Grosjean Mfg. Co., Long Island, N. Y.; ladles and whips, egg, wire	6,278
Charles Mundt & Sons, Jersey City, N. J.; tinplate	17,560
Price Brothers Co., Dayton, Ohio; power shovel, trac-trucks, and bulldozers	8,510
Savory, Inc., Newark; ladles, steel, retinned; measure, tin, lipped, pans, dish; pie plates; skimmers, hot	63,839
Stewart Iron Works Co., Inc., Cincinnati; porch benches	8,666
Taylor Instrument Co., Rochester, N. Y.; instruments	75,000
Taylor Metal Products Co., Mansfield, Ohio; ladles, steel, retinned	8,524
skimmers and turners, cake	17,118
Torrington Co., Torrington, Conn.; needles	10,312
Truck Engineering Corp., Cleveland; semi-trailers	3,756
Van Norman Machine Tool Co., Springfield, Mass.; milling machines	16,569
Western Door & Sash Co., Oakland, Cal.; window screens and guards and doors	15,382
Yellow Truck & Coach Mfg. Corp., Pontiac, Mich.; trucks, 2½ ton	41,227,701
trucks, 1½ ton	26,451

here is 50 tons of aluminum pots and boroughs in London. Said a British you gave to the government appeal defending our island homes and of aluminum pans to be collected in this.

Photo by Harris & Ewing

Machine Tool Output Can Top Billion in 1942, Gaylord Finds

Rockford, Ill.

• • • **"Machine tool production** can reach one billion dollars in 1942 if definite orders can be placed within a few months," Robert M. Gaylord, president of the Ingersoll Milling Machine Co., Rockford, Ill., told THE IRON AGE this week. This figure represents a 33 1/3 per cent increase over the all-time production high of 750 million dollars the industry expects to reach this year.

"The tremendous program dumped on the industry so hurriedly created terrible confusion at first," Mr. Gaylord said. "But we should remember that the scope of the program was and is so huge that no one man or group of men could grasp it in its entirety. Mistakes and confusion were bound to happen. But both are decreasing now."

Gaylord pointed out that the 400 to 500 million dollars worth of additional orders for the aircraft industry can be turned out on time if the definite requirements are made known.

"There are many shipments of new machine tools standing idle on receiving platforms throughout the country waiting for new plants to be finished. At the same time other plants are 'crying' for equipment. More efficient planning is still needed to put machines in the right place at the right time."

Mr. Gaylord pointed out the machine tool industry on May 1, 1941, did not have enough orders on the books to round out the year, and its 1942 backlog on that date amounted to only one month's production. The unfilled orders for '41 totaled $447,000,000. The steady 1941 monthly increase as shown by dollar volume of 51 million in January, 54 million in February, 57.4 million for March, and 60.3 million in April, clearly indicates that the above backlog could be cleared up before the end of the year, allowing, of course, for exceptions in some types which are so-called "bottlenecks."

Actually, the executive declared, the country is or very soon will be getting as many machine tools

Van Deventer Editorials Available in a Booklet

• • • In response to an insistent demand, 30 of the recent editorials by John H. Van Deventer, president and editor of THE IRON AGE, have been reprinted in booklet form.

They have been reproduced by photo-offset on 70 lb. deluxe stock, in full size. Included is a photograph of the author.

Copies of the booklet, while they last, can be obtained at 25¢. Just send coin or stamps to THE IRON AGE, 100 E. 42nd St., New York City, and ask for the editorial booklet.

as it can absorb. Lack of plant structures, competent supervisors, and machine operators are a greater problem than new machine tool delivery.

Mr. Gaylord stated that the industry has proved it can meet defense requirements if given reasonably efficient cooperation and freedom from interference. He said: "When Leon Henderson recently told a group of builders that the government would provide the money to completely double the entire industry, he was told that the industry had all the money it needed. Dollars can't buy experienced men to produce any faster than an industry, which has already expanded more in a shorter time than any in the entire world, is doing.

"Industrialists who are expanding plants with government funds are taking a bigger risk than they realize," Mr. Gaylord, who is also president of the Illinois Manufacturers' Association, concluded. "Aside from the obvious fact that no one ever got anything for nothing—even from government—this practice undertaken behind the skirts of emergency—strikes at the foundations of our system of free and private enterprise."

Costs $500 to Ship 161 Lb. Of Carbide Tool Tips

• • • **Urgently needed in Australia** to build planes, guns, ammunition, tanks, and other ordnance, 161 lb. of Kennametal steel-cutting carbide tool tips were recently flown to Melbourne by Pan American clipper. Transportation charge for this shipment was $500.

Army Bill Provides 10,000 Combat Planes

Washington

• • • **High War Department officials** were watching with interest this week the progress of the pending $9,826,509,492 Army appropriation bill on its way through Congress. Although the measure called for the largest peacetime outlay and the second largest in the country's history, members of the House Appropriations Committee who approved the bill said frankly that the $9,826,509,492 cash and $183,145,695 contractual authority would not last through the 1942 fiscal year.

The amount brought to $30,115,051,142 the total for defense appropriated by Congress or pending for the fiscal years of 1941 and 1942. Broken down, this includes $19,993,051,728 for the Army, $7,836,691,861 for the Navy and $2,285,307,553 for other agencies of the Government.

The Army appropriations bill provides for the construction of 12,856 additional planes, of which 10,000 would be combat. Under its provisions General George C. Marshal, chief of staff, would be given "blank check" authority to place orders for tanks and other equipment in any quantities deemed by him to be essential in the light of world conditions. General Marshal also would be empowered to spend $25,000,000 additional in any manner he saw fit.

Here are the amounts that would be made available for a few of the items under the provisions of the bill as approved by the House committee:

New critical and essential items, $402,400,000; new boats, $22,247,000; military post construction, including Air Corps, $276,000,000; Atlantic bases, $51,000,000; new motor vehicles, $21,000,000; spare engines and spare parts for bombers, $245,000,000; additional aircraft, $2,650,000,000; barrage balloons, $45,000,000; seacoast defenses, $92,000,000; research and developments, $67,000,000; maintenance aviation pilot and technical program, $141,249,000; maintenance and operation of plant and equipment, $750,000,000.

Beech Aircraft Order Exceeds $50 Millions

Washington

• • • **The War Department last week** awarded contracts to the Beech Aircraft Corp., Wichita, Kan., for aircraft and spare parts to cost $50,699,902. At the same time the Department awarded a $2,757,828 contract to the William Muirhead Construction Co., Inc., of Durham, N. C., for the construction of a quartermaster depot at Charlotte, N. C. It also announced the selection of Minden, La., 23 miles east of Shreveport, as the location for a $29,000,000 shell loading plant.

Machine Tool Fund Increased $17 Millions

Washington

• • • **The War Department last** week announced that it has added another $17,000,000 to its revolving fund for the purchase of machine tools. This money will be used to purchase machine tools for the manufacture of certain new ordnance items for which contracts have not been let. By thus anticipating machine tool demands, the War Department said that it helps to eliminate the bottleneck in this critical field.

In November, 1940, $15,000,000 was made available for this purpose. In January, $2,000,000 was authorized for the purchase of key machine tools manufactured for export but for which export licenses had been denied. In taking over these tools the War Department has paid the original purchaser for them and in turn sold them at current prices to the most needy defense contractors. Quantities of machine tools that were originally destined for foreign governments have thus been taken over and immediately put to use in the country's vital rearmament program.

These authorizations constitute a revolving fund in that the War Department places the original orders, then later releases the tools to industries making vital munitions. In this manner several months' lag is eliminated.

Steel to Cuba Off 13.5% in '40; Structural Imports Higher

• • • **Cuban imports of** American steel fell off about 13.5 per cent during 1940, amounting to 67,045 tons as against 77,567 tons imported in 1939. More than 99 per cent of Cuba's 1940 imports of steel were from American sources, while heretofore American steel ran about 80 per cent of the total imported by Cuba.

Construction material imported during 1940 was heavy, but not enough to counterbalance the lower volume of trade in railway material, barbed wire, pipe and fittings and products of lesser importance.

New England Foundrymen Hold June Meeting

Boston

• • • **The June meeting** of the New England Foundrymen's Association was held the eleventh at the Engineers Club, Boston. Speakers were P. B. Richardson, district sales manager of the Harbison-Walker Refractories Co., whose subject was refractories; F. R. Elliot, superintendent of foundry operations at the Westinghouse Electric & Mfg. Co., whose subject was gates and risers; Robert Loss turbo-blower department of Ingersoll-Rand Co., control of air in the cupola; Warren V. B. Baker, metallurgist, Standard Foundry Co., Worcester, Mass., cupola practice and slag control.

UAW Strikers Defy Roosevelt as Army Seizes Plane Plant

• • • **Organized labor** in the United States, grown bold after years of almost uninterrupted successes and of encouragement by the federal and some state governments, this week took the boldest step of all.

At the North American Aviation Co. plant at Inglewood, Cal., union labor, represented by the CIO-UAW, tried to prove it is "bigger than the government." Failing to get a 25c. an hour wage increase, the union tried to keep idle the North American factory, which has one-fifth of all U. S. plane capacity.

President Roosevelt's emergency speech (May 27) had found strike leaders on the West Coast unsold on the nation's need for planes, unsold on peaceful collective bargaining, unsold on the public's right to force production of vitally needed aircraft from the North American Aviation plant.

It took the Army, ordered into action by the President's executive order of June 9 to get the aircraft plant open. Among those ignored by the UAW union in the general demand that the plant be reopened and the wage controversy threshed out later, was Philip Murray, head of the SWOC and the CIO and member of the National Mediation Board. Murray had sought to end the strike.

Elsewhere, strikes in U. S. industry were increasing, with the President's radio warning that the "government is determined to use all of its power to express the will of its people" taken lightly by many union leaders. Friends of labor, believing that many of its gains in the last few years were justified, saw danger of the long delayed swingback of the labor union pendulum, starting with the Army's seizure of the California plant.

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Pittsburgh

• • • **At least 10 strikes** have occurred or have continued in this district since President Roosevelt proclaimed the national emergency on May 27. Four of these were sponsored by AFL workers and the remaining six by CIO unionists.

Although these strikes have been relatively small and did not involve a large number of employees, production and transportation of material has, to some extent, affected the national defense program. Products affected included building materials, chemicals, steel, castings, copper shells and structural steel. Most serious strike has involved truck drivers in this district and although it is claimed that national defense material is being allowed to pass through the picket line, there is little doubt that raw materials ultimately destined for national defense purposes are being retarded

as far as delivery is concerned.

A rough estimate of the strikes in question indicates that more than 250,000 man hours have been lost so far and seven of the strikes were still in progress when this report was written. Wages constituted the reasons for six of the strikes while other working conditions were responsible for the remaining four. A list of the 10 strikes which started or were in progress since the president's message, some of which have now been settled, are as follows—

AFL truck drivers, 700 employees in the building material industry.

AFL truck drivers, general transportation, 1400 employees.

Koppers Co., East Steubenville, Ohio—UMW—400 employees, defense chemicals.

Koppers Co., Follansbee, W. Va. —UMW—175 employees, defense chemicals.

Mackintosh Hemphill Co., Pittsburgh — SWOC — 450 employees, defense material, strike settled.

Ohio Foundry Co., Steubenville, Ohio—SWOC—castings.

Apollo Steel Co., Apollo, Pa.—SWOC—1000 employees, steel defense items.

C. G. Hussey Co.—AFL—750 employees, copper defense items, strike ended.

Pressed Steel Car Co.—SWOC—60 employees, shell production, ended after one day.

Structural iron workers—AFL —60 employees, building construction.

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Cleveland

• • • **A strike affecting** nearly 600 workers began May 25 in Fostoria, Ohio, at the plant of Seneca Wire & Mfg. Co. and was still unsettled June 5. The dispute had not been certified to the National Defense Mediation Board. The company's output goes into the defense program indirectly.

Officials of the Seneca company said it was the first labor trouble in 30 years. They described the CIO wage demands as being "entirely impossible," and asserted the union had walked out on negotiations.

In Cleveland, a CIO strike at the Picker X-Ray Co. plant began June 2 and ended June 9. The company is an important supplier of portable X-Ray equipment for the Army. At Barberton, Ohio, a "labor holiday" of 500 workers for the Ohio Brass Co. became an official strike June 5. The plant makes insulators essential to the electrical industry and has other orders. The CIO electrical workers union was involved.

A strike threat at Cleveland plants of the Aluminum Co. of America hung ominously over Cleveland last week. It was postponed several times by the National Association of Die Casters at the request of the National Defense Mediation Board which was scheduled to begin hearings Monday, June 9. The plants make vital

aircraft forgings and other aluminum parts.

While the four-day work stoppage at the huge new Ravenna, Ohio, shell-loading plant ended before President Roosevelt's May 27 speech, nevertheless construction had not recovered fully by June 5. Laborers being rehired were being charged $19 dues by the AFL hod carriers union. Some wage questions were still in the air. Piles of conduit, welding wire, and other types of steel grew larger during the four-day strike which was said to be "illegal" by union leaders.

Detroit

• • • **A 28-hour strike** at The Great Lakes Steel Corp., Ecorse, Mich., was staged last week by the SWOC-CIO. The strike was started late Tuesday, June 3, less than one week after President Roosevelt's declaration of an unlimited emergency in the United States and brought a union demand for a wage boost of 7c. an hour, on top of the 10c. an hour already granted by National Steel Corp. nationally.

A demand for speedy writing of a plant contract with the union was also a major issue. The strike did not stop blast furnace or open hearth operations but affected both the mill and Hanna Furnace Co. on nearby Zug Island.

Partial settlement of the issue was effected by Federal Labor Conciliator James F. Dewey with assurance by him to the union workers that they would get a contract. He was quoted as saying: "As a representative of the United States Government, I told Mr. Fink (George R. Fink, president of Great Lakes) this afternoon (Wednesday) this strike will have to be settled and you will have to sign a contract and sign it now." Company sources indicate that the federal conciliator's attitude is friendly and helpful, but it is anticipated that a contract will be signed shortly as a result of negotiations now being conducted.

The wave of strikes that has swept Detroit seems temporarily at a low point. But strike threats exist in several plants. Apparently these are aimed largely at pushing the general wage level up the 10c. step which has been taken in several recent instances. Both Aluminum & Brass Co., and Briggs Mfg. Corp. were recipients of strike notices immediately after Chrysler workers began voting on acceptance of a new wage agreement providing an 8c. raise and payment of a $45 Christmas bonus. General Motors Corp. has just signed a similar agreement pro-

WHAT EMERGENCY? Young strikers gaily picket the North American Aviation Co. plant at Inglewood, Cal., tying up one-fifth of U. S. plane production. The plant, shown at left, employs more than 11,000 men. President Roosevelt ordered the Army to take over the plant if the strike did not end last Monday. When the deadline came the troops took over.

viding a 10c. raise for union workers and has given a $15 a month raise to office workers and others not covered by union contract in the salary level below $200 a month, plus salary adjustments to other employees below the executive bonus classification.

The spring plant of Detroit Steel Products Co. is closed in a second phase of a strike which has tied up the main plant for nearly a month. The strike already has delayed completion of $300,000,000 worth of government buildings in the United States and Canada because the company cannot ship steel sash for windows and doors. The closing of the spring plant will halt production of spring seats for army trucks being manufactured by GM and Dodge.

Indiana Workers Draw Less in Idle Benefits

Indianapolis, Ind.

• • • **Indiana workers drew** 54 per cent less in unemployment compensation benefits in April, 1941, than they did in the same month a year ago. Figures released by the state Employment Security Division showed $357,932 paid out this year compared to $787,169 withdrawn in April, 1940.

Automotive Material Substitutions

(CONCLUDED FROM PAGE 59)

radiators. Some years ago these solders contained 40 per cent tin, but this percentage has been gradually reduced until today radiator solder contains about 10 per cent tin and 90 per cent lead. On this basis the amount of tin in radiator solder per car is less than ½ lb. If tin is curtailed, several alternates are available to replace tin-bearing radiator solder, including hydrogen brazing.

Terne plate, containing about 20 per cent tin and 80 per cent lead, is used extensively on automobile mufflers, cylinder-head gaskets, and other parts. In a tin shortage, straight carbon steel or copper would be used instead of the terne-plated steel for mufflers and steel-and-asbestos or embossed thin-steel gaskets would be substituted.

Some are of the opinion that critical shortages in manganese may develop before they do in chromium. In case of an acute manganese shortage, it is believed that only the manganese SAE 1300 and X 1000 steels, which contain up to 1.90 per cent manganese, would be affected. In addition, the amount of manganese (from 0.20 to 1 per cent) present in all other SAE steels probably could be reduced by juggling other alloying elements. Whether or not an acute manganese shortage would bring serious problems, metallurgists believe, depends upon the availability of other alloying elements such as nickel, chromium, vanadium, molybdenum, and silicon. In the case of the free-cutting screw-stock X 1300 steels, equivalent machinability can be had with less sulfur and manganese through the use of lead.

In case of a shortage of antimony for antimonial-lead die castings containing 8 to 13 per cent antimony, they can be replaced by parts of plated stamped steel, or plastics in most instances. It is also possible that, by the time such a shortage develops, the present bottleneck in zinc may be relieved so that engineers could go back to the original zinc-alloy die castings. To replace the 10 per cent of antimony used in the average storage-battery grid, metallurgists claim that 0.1 per cent of calcium can be substituted satisfactorily.

1. Substitutions of alternates for critical materials made or definitely planned to date will necessitate no lowering of the standards of safety, durability, performance and comfort established in the 1941 passenger cars. So far, all alternate parts are required to pass the same proving ground and laboratory tests used on the original critical parts.

2. In virtually all cases, parts of alternate materials cost more than do the former critical parts, the increase being proportional to the amount of new tooling, extra machining, or other additional processing necessary, and to the speed with which the shift must be made, as well as to the comparative cost of the material in the parts. These added costs are running into millions of dollars throughout the industry.

3. Although adopted through necessity, there are indications that some of the alternate parts will stay permanently in automobiles after the emergency is over since they will have time to prove their worth, demonstrating hitherto undiscovered qualities. In addition, the cost of many of these parts will have been lowered through design and production development. This is one of the brightest spots in the picture since the exigencies of the emergency will force many developments that would not have been made under normal conditions.

Defense Engineering Training for Women

Chicago

• • • **Defense engineering** training for women has come at last. Spurred by demands of the new aircraft engine plants under construction here, Illinois Institute of Technology has set up free 10 week courses of training for specific jobs, which are open equally to women as well as men. For instance, the Buick engine plant wants metallurgists, pyrometer operators, inspectors, and other trained people. Henry T. Heald, president of the institute, said: "There is no fundamental reason why women cannot be successful in engineering. Women are doing good work in many routine technical operations in plants right now. They make excellent inspectors, for one thing. With the pressure for skilled men so heavy, there is no reason why women can't help relieve the load.

Railroads to Get Higher Priority Rank, Budd Says

Chicago

• • • **Railroads will be** given equal rank in priorities with munitions manufacturers, Ralph Budd, president, the Burlington Railroad and transportation member of the National Defense Advisory Commission, promised the American Association of Railroad Superintendents meeting here.

Compromises—such as redesign of sleeping cars to take only 400 lb. of aluminum instead of as much formerly as 10,600 lb. per car—will have to be made. But essential allocations, especially of steel, are certain.

Right now, Budd said, defense freight is not as heavy as expected. About 25 per cent of steel hauled is for defense, and about 45 per cent of plates is estimated as for defense. These proportions will rise very rapidly. Freight traffic for the first five months of this year was 16 per cent ahead of last year. Figures for 1941 show 40,000,000 carloads, compared with 36,354,000 in 1940 and nearly 53,000,000 in 1929. However, it was declared defense program is moving so rapidly that all railroad figures today are simply estimates and cannot be accepted as accurate.

Defense Leaders Recognized In Stevens Honor Degrees

• • • **Signalizing the preoccupation** of the country with national defense measures, Stevens Institute of Technology, Hoboken, N. J., conferred honorary degrees on June 7 on men in military and civil life for distinguished service to defense on both the production and combat fronts. Degrees of Doctor of Engineering were conferred on Guy W. Vaughan, president of Curtiss-Wright Corp. and the Wright Aeronautical Corp.; Maj.-Gen. Charles M. Wesson, chief of ordnance of the United States Army; Rear Admiral Harry E. Yarnell, United States Navy, retired, and former commander of the Asiatic Fleet, and Wendell L. Willkie.

The honorary degree of mechanical engineer was conferred upon Edward W. Miller, general manager of the Fellows Gear Shaper Co., Springfield, Vt.

New Allison Engine Develops 175 More Hp.

• • • **An improved model** of the Allison V-1710 liquid cooled aircraft engine has been announced by F. C. Kroeger, general manager of the Allison division of General Motors Corp. He announced that the improved model, of the same size as the Allison engine which the army has been specifying for the past two years, has just passed its tests, delivering 1325 hp. for take-off purposes as a military engine. This is an increase of 175 hp. from the 1150 hp. which has been the top rating on Allison engines. The complete power plant weighs 1303 lb., ready for installation, so its weight to horsepower ratio is actually less than one.

The announcement did not discuss the improvements by which the 15 per cent increase in power was made available.

Canada War Output To Reach Peak In '42

Toronto

• • • **Canada's war industry** is being expanded by leaps and bounds with many new lines of manufacture being introduced to the Dominion's production. In addition to the establishment of new industries financed by Canadian capital, a large number of new plants are under construction or to be erected in this country as subsidiaries of United States or British companies with financial obligations on the latter account running to upwards of $100,000,000. While there is no undue delay on construction operations the equipping of new plants is something of a problem as there is considerable delay in obtaining delivery of machine tools and other machinery. Bottlenecks have developed in most of the large war industries as a result of shortage of special equipment with the result that some of these plants are producing only about 25 per cent of what would otherwise be capacity output. Machine tool builders in Canada are operating at maximum capacity with many carrying backlogs that will not be cleared for about two years. Industrial leaders do not expect Canada to reach maximum war production until the latter part of 1942 although on some lines of manufacture the next three or four months will see substantial increase in output. To augment supply of machinery and tools it is reported that large orders have been placed in the United States with others to follow. Practically all the usable old tools and equipment that were available in Canada before the war now have been taken over and reconditioned and now are in use.

Providing of necessary raw materials, especially steel, is another problem that is retarding more rapid speeding up of war materials production. Primary producers are maintaining production to the limit of their capacity, with the principal bottleneck in this respect charged to raw materials for steel making, pig iron and scrap. Backlogs on sheets and plate will absorb all Canadian output to the end of this year with large carryover into 1942. Orders for merchant bars, carbon and alloy steels also are mounting rapidly and delivery dates are being pushed toward the year-end. In an endeavor to relieve some of the pressure on the larger producers of bolts, nuts, etc., it now is reported that several plants, including automobile repair shops, are preparing to install equipment for production of these materials.

The Canadian government, through the Department of Munitions and Supply, Ottawa, has arranged for the construction of a huge new drydock at Saint John, N. B., to cost approximately $3,000,000 which will take care of repairs to the largest types of vessels and provide facilities for new ship construction. Canadian Dredge & Dock Co., Ltd., has received the construction contract for the drydock which will be located alongside the present facilities of the Saint John Drydock & Shipbuilding Co.

The Department of Munitions and Supply is speeding up the awarding of new war orders. During the past week officials of the department announced the awarding of war contracts aggregating $65,520,540, involving the placing of 2870 individual orders. Included in the commitments were orders to United States companies totaling $11,158,465. Awards include:

Mechanical transport — Ford Motor Co. of Canada, Ltd., Windsor, $1,391,233; Bickle-Seagrave Limited, Woodstock, $30,320.

Aircraft—DeHavilland Aircraft of Canada, Ltd., Toronto, $391,071; The Coleman Lamp & Stove Co., Ltd., Toronto, $204,338; Fleet Aircraft Limited, Fort Erie, $147,216; Aviation Electric Limited, Montreal, $25,452; Canadian Wright Limited, Montreal, $134,325; Air Ministry, England, $30,000.

Ordnance—Air Ministry, England, $27,970; Canadian Power Boat Co., Ltd., Montreal, $87,450; John Hay & Co., Ltd., Ottawa, $24,960; Western Steel Products, Ltd., Ottawa, $60,665; Small Arms, Ltd., Long Branch (Toronto), $59,500.

Munitions—Dominion Arsenals, Ottawa, $42,122; N. Slater Co., Ltd., Hamilton, $30,252.

War construction projects — Canadian Ingersoll-Rand Co., Ltd., Montreal, $50,000 for equipment for Canadian Propellers, Ltd., Montreal; Magloire Couchon, Ltd., Quebec, Que., $450,000, for addition to Dominion Arsenal, Valcartier, Que.; Rhodes, Curry, Ltd., Amherst, N. S., $140,000, for addition to plant of Canadian Car &

U. S. S. TERROR: This is the first U. S. Navy vessel specifically designed as a mine-layer from the keel up. It was launched June 6 at the Philadelphia Navy yard.

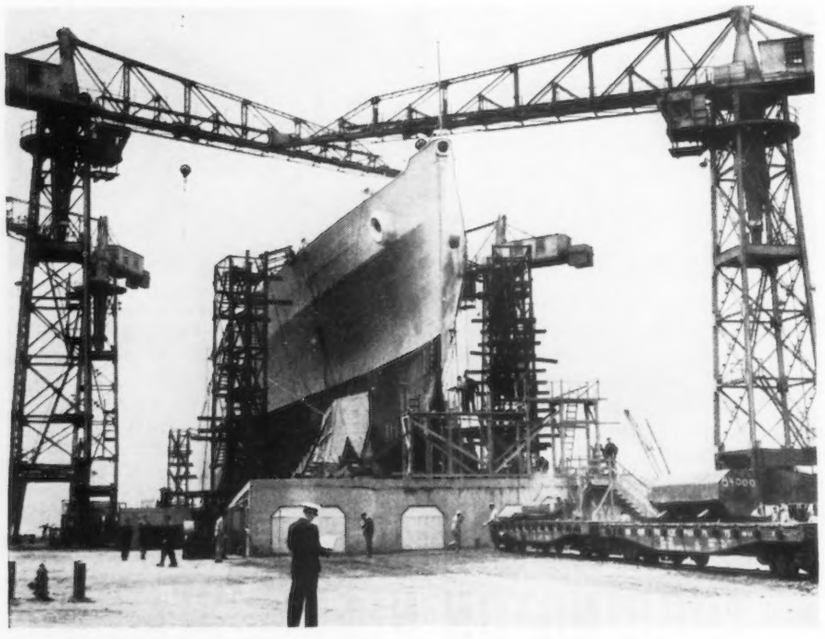


Photo by International

BOMBERS FOR CONVOYS: Lacking sufficient warships for convoy duty in the Atlantic, Britain may depend on heavy bombers made in the U. S. to protect its most important ocean lifeline. Shown here is such a convoy at sea.

Foundry Co., at Amherst, N. S.; Dominion Bridge Co., Ltd., Lachine, Que., $73,000 for structural steel for addition to Canadian Propellers, Ltd.; M. A. Condon & Son, Kentville, N. S., $126,000; Hill-Clark-Francis, Ltd., New Liskeard, Ont., $661,883; Shoquist Construction Ltd., Saskatoon, Sask., $288,760; Bennett & White Construction Co., Ltd., Calgary, Alta., $356,363; Buchan Construction Co., Calgary, Alta., $206,892.

NLRB Elections to be Held in 6 International Harvester Plants

Chicago

• • • **Union representation elections** conducted by NLRB for 20,000 International Harvester Co. employees will be held on June 18. The board has ruled that all production and maintenance employees will be eligible to vote for CIO or AFL, or neither. Elections will be held at McCormick and West Pullman plants in Chicago, and in plants at East Moline, Rock Island and Rock Falls, Ill., and Milwaukee, Wis.

Powered Assembly Line Set Up At Vultee Plant

• • • **Vultee Aircraft, Inc.,** reports it has increased production of military planes fourfold at its California plant by installation of the first powered mechanized final assembly line in the industry. Operation of the new overhead conveyor system marks another step toward the achievement of mass production methods in aircraft manufacture, and marks the transition from the old "custom built" basis of airplane construction.

More than a mile of overhead conveyor system has been installed, which has resulted in a 50 per cent reduction in final assembly time.

Commenting on the new production system, Richard W. Millar, Vultee's president, said: "Although the results of our development of new production methods are most obvious in the mechanization of our final assembly line, it must be remembered that the entire plant has had to be rescheduled to the point where production in every department is geared to the new requirements of the final assembly line. In order to assure the efficiency of the moving assembly line, every last part used in the airplane must flow to its appointed assembly station on a strict schedule basis.

"The problem of gearing parts production to final assembly and the split-second timing of operations, especially in view of changes in specifications during the course of a contract, has heretofore led industrial engineers to the conclusion that powered assembly lines could not readily be adapted to the aircraft industry.

Wildcat Strike Staged At Lamson & Sessions

Cleveland

• • • **A labor dispute** arose suddenly Tuesday at the East 63 Street plant of Lamson & Sessions Co. affecting approximately 450 workers. The plant contains a special production division for making bolts and nuts for the aircraft industry. Officials of a CIO-UAW union said the strike was a wildcat affair. The company's main plant here was not affected.

J.&L. To Issue New Stock, Pay Dividends

• • • **Stockholders of Jones & Laughlin Steel Corp.** were told this week that the company plans to merge two of its subsidiaries, convert its present stocks into new stocks, inaugurate regular dividends on a new preferred stock beginning with the first quarterly dividend date and at the same time inaugurate dividends on a new common stock.

NEW J. & L. STOCK: H. E. Lewis, above, Jones & Laughlin Steel Corp. chairman, this week announced drastic revisions in J. & L.'s capital structure.

A special shareholders' meeting will be held July 22 in Pittsburgh to vote on a merger into J. & L. of the Vesta Coal Co. and Shannopin Coal Co. Under the proposed plan of merger, basis of the conversion of the present stocks into new stocks would be as follows:

The holder of each share of present 7% preferred stock will receive for each such share (1) one-half share of new 5% cumulative preferred stock, Series A ($100 par) and (2) one-half share of new 5% cumulative preferred stock, Series B, convertible ($100 par), each full share of which may be converted at any time into three shares of new common stock, and (3) one and one-quarter shares of new common stock (no par value).

The holder of each share of present common stock will receive for each such share one share of new common stock.

In a letter addressed to shareholders, H. E. Lewis, chairman of the board, said:

"The Board of Directors of the corporation after thorough study and consideration has come to the conclusion that it is both impracticable and unwise from the standpoint of the preferred shareholders, and the corporation as a whole, to attempt over any reasonable period of time to pay off in cash the total sum of the accumulations on the preferred stock. The Board believes that under the most ideal conditions in the future this process would require a substantial number of years for its accomplishment, during which period the corporation's credit standing and ability to finance possible new capital requirements would be impaired.

"Although the management of the corporation has no immediate plans requiring financing for additions to plant and equipment or for other purposes, changes in the products and processes of the steel industry from time to time come so rapidly and require such large sums of money that no predictions can be made with reasonable assurance for any period of time in the future as to requirements for new capital."

C-I Operates New 42-in. Mill

Pittsburgh

• • • **Carnegie-Illinois Steel** Corp. recently put into operation a new five-stand tandem four-high 42 in. cold mill for the manufacture of cold reduced tin plate.

This project, announced some time ago, carries to completion the original plan of having two high-speed tandem cold mills in operation at the tin plate plant. The installation of the first tandem mill produced tin plate at a rate considerably greater than had been originally anticipated. The addition of the latest unit for cold reduced tin plate at Irwin has been practically doubled. These mills, however, are capable, in times of necessity, of rolling certain sheet sizes.

Agreement Averts New Coal Shutdown

• • • **Danger of another soft coal industry strike with a threat of delay to the defense program was removed this week when Northern and Southern coal operators and the CIO-United Mine Workers union adjusted their wage controversy. A 40c. wage differential between Northern and Southern mines was eliminated. John L. Lewis' union also won elimination of the "reject" clause under which miners were paid not for run-of-mine coal but only for clean and marketable product, and for annual vacations with pay of $20.**

The National Mediation Board, which arbitrated the controversy, brought about the establishment of a $7 basic daily wage for the entire Appalachian soft coal area. Under the agreement expiring April 1, the rate was $6 for Northern mines and $5.60 for Southern mines.

5 Aluminum Plants Shut Down By CIO

Cleveland

• • • **Walking out under** a prearranged plan while the National Defense Mediation Board barely had started examining their wage demands, strikers tied up $60,000,000 in defense orders at the large Aluminum Co. works here starting Monday and completely paralyzed the five plants of the division.

Aluminum forgings for the aircraft industry are produced here. As the work stoppage would affect output of fighting planes it was likely drastic government action might take place toward restoring operations. Some of the strikers exempt from selective service were scheduled to be reclassified.

The CIO Die Casters Union is seeking 4½c an hour wage increase in addition to the general 8c per hour raise granted by the company April 22. The union also is asking 3c per hour more in starting pay, from 72 to 75c. Vacations for new men and a bonus for night work also were among demands.

Strikers were handed mimeographed instruction sheets showing them where to picket. Plans were made at a meeting Saturday prior to the start of hearings Monday in Washington by the Mediation Board.

Philadelphia Electric Buys Chester, Pa., Blast Furnace

Philadelphia

• • • **The Chester, Pa.,** blast furnace of Delaware River Steel Co., has been purchased by the Philadelphia Electric Co. In rebuilding their idle by-product coke plant at Chester, Philadelphia Electric purchased the adjoining Delaware property, including the blast furnace, to provide space necessary for its coke oven program.

Philadelphia Electric Co's., charter prevents the company from operating the furnace, but it is believed that the furnace will be operated by a steel company. Although idle for the past 11 years, the furnace can be put into service in a short time.

U. S. Produces Only Half Tungsten Needs Since 1929

Washington

• • • **Quadrupling the output** of 1929, production of American tungsten mines and mills in 1939 was 3240 tons of direct-shipping ore and concentrates amounting to 3,059,000 lb. of tungsten, according to the Bureau of Census. Because of the inadequacy of the domestic supply and the fact that the metal and its alloys have found many important uses for which, with the possible exception of molybdenum, no satisfactory substitutes exist, tungsten has been classed by the Army and Navy Board as a strategic material for national defense.

Since 1929, the census report said, the United States has produced only about one-half of its tungsten needs, which chiefly are for high-speed tool steels. Steps have been taken by the government to preserve and augment the supply of tungsten by authorizing and financing the accumulation of reserve stocks and by aiding the search for new deposits.

Tungsten imports during the same year, according to the Bureau of Foreign and Domestic Commerce totaled:

Ore and concentrates amounting to 2,743,472 lb., with a tungsten content of 1,485,157 lb., and tungsten metal and combinations amounting to 40,198 lb. In addition, duty-free imports for smelting, refining, and export amounted to 589,828 lb.

Tungsten exports, during 1939, totaled 194,926 lb. of metal, wire, shapes, and alloys.

Imports of the metal in 1940 increased somewhat, as did the exports. Imports included ore and concentrates of 10,829,093 lb. with tungsten content of 5,610,882 lb., and tungsten metal and combinations of 36,652 lb. Duty-free imports for smelting, refining and export amounted to 1,348,495 lb. Exports in 1940 of tungsten metal, wire, shapes, and alloys totaled 237,940 lb.

U.S. Steel's May Shipments A Record

• • • Shipments of finished steel products by subsidiary companies of United States Steel Corp. in May reached the all-time high of 1,745,295 net tons. Shipments in April were 1,687,674 tons. For the current year to date, shipments total 8,384,240 tons, compared with 5,078,714 tons in the comparable period of 1940.

Canada Cancels All Pig Iron Orders

Ottawa

• • • **To conserve iron and steel** for essential war industries, all orders on the books of Canadian pig iron producers as of June 9 have been canceled, according to instructions issued on Monday by H. D. Scully, Steel Controller of the Department of Munitions and Supply. Mr. Scully stated "an acute shortage of pig iron has existed in Canada for some time, but we felt that control measures should not be instituted until a thorough statistical summary of production and consumption has been completed and meetings held with the foundrymen and blast furnace operators." New customer orders must now be forwarded to the Steel Controller for approval which will be given on the following preference basis: castings requied for war work; castings required for transportation systems, mining and petroleum industries, and public utilities; castings for agricultural implements, and the pulp and paper, and lumber industries; and castings not otherwise classified.

May Steel Production Second Highest in History

Based on reports by companies which in 1940 made 92.91% of the open hearth, 100% of the bessemer and 85.82% of the electric ingot and steel for castings production

Period	Estimated Production—All Companies								Calculated Weekly Production, All Companies	Number of Weeks
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net Tons	Percent of Capacity	Net Tons	Percent of Capacity	Net Tons	Percent of Capacity	Net Tons	Percent of Capacity		
January	6,271,862	99.0	451,637	76.0	205,256	93.4	6,928,755	96.9	1,564,053	4.43
February	5,673,289	99.2	378,330	70.5	186,281	93.9	6,237,900	96.6	1,559,475	4.00
March	6,461,936	102.0	460,169	77.4	209,536	95.4	7,131,641	99.7	1,609,851	4.43
1st Quarter	18,407,087	100.1	1,290,136	74.8	601,073	94.2	20,298,296	97.8	1,578,406	12.86
April	6,130,638	99.9	395,009	68.6	232,081	109.1	6,757,728	97.6	1,575,228	4.29
May	6,406,838	101.1	444,361	74.8	250,560	114.0	7,101,759	99.3	1,603,106	4.43

Note—The percentages of capacity operated are calculated on weekly capacities of 1,430,102 net tons open hearth, 134,187 net tons bessemer and 49,603 net tons electric ingots and steel for castings, total 1,613,892 net tons: based on annual capacities as of December 31, 1940, as follows: Open hearth 74,565,510 net tons, bessemer 6,996,520 net tons, electric 2,586,320 net tons.

Quick Decision Seen On OPM's 10-Million Ton Steel Expansion

Washington

• • • **Quick determination is** expected to be made by the OPM regarding "tentative" plans it and the OPACS have discussed with members of the Executive Subcommittee of the Iron and Steel Industry Defense Committee for a 10,000,000-ton expansion program. Meanwhile OPM is preparing to curtail production of sheet and strip steel and to use rolling mill capacity thus released to turn out plates for shipbuilding, railroad car building and other urgent defense purposes. W. A. Hauck, OPM steel consultant, last week visited sheet and strip mills at Pittsburgh, Buffalo, Detroit, Cleveland and Youngstown, Ohio, to determine the appropriate measures to be taken.

The subcommittee, responsive to a request of OPM, official sponsor of the expansion plan, conferred with members of the iron and steel industry in New York last Thursday, in connection with a canvass to determine which companies can enlarge their plants, and was asked to report to the OPM at the earliest convenient date. At the same time OPM asked companies desiring to participate in the plan to submit information to the government defense organization. Information called for from steel companies relates to the tonnage capacity they believe they can add to their present capacity; the geographical location of this capacity; its cost; the finished products it would be ready to produce; the time required for such enlargement, given proper priorities; the estimated amount of the steel required for such enlargement and the proposed methods of financing.

The proposed wide-scale increase in iron and steel capacity for a long period has been urged by expansionist groups in both OPM and OJACS. The plan suddenly revived shortly after and in the face of the second Gano Dunn steel report, which distinctly pointed to the difficulties of such an expansion, came as a surprise.

The project was discussed at a secret meeting of representatives of the OPM and OPACS together with Federal Loan Administrator Jesse Jones and Undersecretary of the Navy James V. Forrestal held on Tuesday of last week with Benjamin F. Fairless, president, United States Steel Corp., and Eugene G. Grace, president, Bethlehem Steel Co., members of the Executive Subcommittee of the Steel Industry Defense Committee. It is reported that originally discussion centered around a 6,000,000-ton expansion program but that subsequently the figure was raised "tentatively" to 10,000,000 tons, with the result that the impression has been gathered that the higher figure may be scaled down, though in some quarters an opposite forecast is made that even a greater expansion program may be decided upon. Mr. Dunn said that a 10,000,000-ton increase would require 4,160,000 tons of ingot steel and two years or more to build.

Allocations among five or more steel companies for 10,000,000 tons are said to have been suggested at the Washington meeting, based largely but not entirely upon existing capacity and capacity under construction. OPM representatives at the meeting were John D. Biggers, chief of production, and S. D. Fuller, raw materials chief. The presence of Mr. Jones was accounted for by the fact that it is proposed that the cost of expansion be financed entirely or mostly by the government. Mr. Henderson is said to be particularly insistent upon wide-scale expansion at once, differing greatly with Mr. Dunn's estimate of 67,000,000 tons of steel for civilian use in 1942. Mr. Henderson estimates that there will be only 36,000,000 tons for non-defense purposes. The cost of a 10,000,000-ton increase in capacity is estimated at from $800,000,000 to $1,250,000,000, the latter being Mr. Dunn's figure.

Mr. Hauck's survey emphasizes pressure of demand for plates for carbuilding and shipbuilding and OPM has made it known that it will issue priority certificates for plates for these lines of construction. Mr. Hauck's trip was made in order to learn the increased plate production that can be achieved by converting continuous strip and sheet mills to plate output. Some of these flexible mills are already equipped to turn out plates as well as sheets and strip. It is estimated that continuous mills are presently equipped to produce plates up to ⅝-in. thick, covering car and ship requirements, at the rate of 1,500,000 tons annually. While considerable time will be required to equip other continuous mills for the purpose it is estimated that they can produce an additional 1,000,000 tons of plates.

These accretions would provide an annual plate capacity of approximately 8,000,000 tons, since the existing plate mill capacity ranges between 5,500,000 and 6,000,000 tons annually. Total railroad steel requirements for the remainder of 1941, as recently reported to OPM by the AAR were approximately 5,000,000 tons of which only 1,923,262 tons consisted of plates, shapes, bars, sheets, billets, etc.

The curtailment of sheet and strip output in order to increase plate production indicates decreased steel supplies for the automobile, refrigerator and other industries using the two flat rolled products. OPM said, however, that production for these industries will be continued to the extent that defense needs do not engage available facilities.

Continuous mill plants visited by Mr. Hauck included those of the Jones & Laughlin Steel Corp., and the Carnegie-Illinois Steel Corp., Pittsburgh; Bethlehem Steel Co., Buffalo; Great Lakes Steel Corp., Detroit; Republic Steel Corp., Cleveland; Youngstown Sheet & Tube Co., Youngstown, Ohio.

↓ ↓

Pittsburgh Believes Steel Capacity Dispute Near End

Pittsburgh

• • • **Apparently the government** and the steel industry have reached a compromise on the steel question of adequacy of capacity, after several weeks of negotiations, meetings, and analysis of reports.

The compromise will utilize a "reasonable" expansion of existing facilities concurrent with definite curtailment of civilian re-

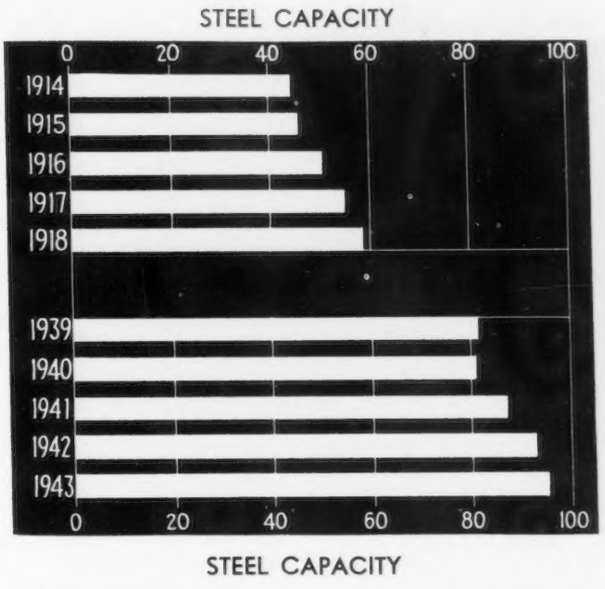
quirements when they interfere with production of national defense material.

Pittsburgh steel makers believe that inasmuch as basic ingot production facilities have increased less rapidly here than elsewhere and because some of the units are considerably older, a fair proportion of the proposed 10,000,000 tons a year increase might be built in or near this district. Actual allocation of the increased tonnage, however, awaits studies now being made by the OPM and by the special iron and steel industry defense committee.

The construction of increased facilities for ingot production will, of necessity, reach back to pig iron capacity, coke capacity, ore boat space, and mining operations. This gigantic experiment will necessitate, according to current reports, as much as 4,000,000 tons of steel which in itself will mean a further restriction of civilian supplies, inasmuch as such construction will undoubtedly receive preferential treatment.

Both the government and the steel industry, in reaching their compromise, apparently gave way to original stands on the matter. The steel industry, in the main, still believes that expansion is not necessary if defense requirements are placed completely ahead of civilian demand in case of necessity. Certain government officials, on the other hand, have advocated an expansion of far more than 10,000,000 tons a year, holding that the national income to be expected in the next few years would support an ingot capacity in excess of 120,000,000 tons.

Practical students of the steel industry, however, are not confusing themselves with astronomical tonnage figures or capacities. They are well acquainted with the fact that the present shortage in certain steel products is brought about, not by the lack of fundamental capacity, but rather by the impact of simultaneous demand from several national defense projects which must be expedited at the earliest possible moment. Such projects include shipbuilding, railroad car fabrication, urgent pipe line construction, etc., many of which did not loom as large in the initial planning stage some months ago.



STEEL IN TWO WARS: How steel capacity (millions of net tons) in the U. S. increased during the First World War, from 1914 through 1918, and how it will increase during the second World War, from 1939 through 1943, if OPM's 10-million ton capacity increase plan is adopted, is shown above. Graph is based on rated capacity which includes allowances for normal shutdowns, as calculated by American Iron and Steel Institute, with estimates for 1941 to 1943 based on capacity increments reported by Gano Dunn, plus the 10-million ton increase spread over two years.

From a steel economic standpoint, it is believed that inasmuch as there is a national emergency and since the steel capacity of the country is adequate to much more than meet American and British defense needs by curtailment of civilian requirements, then any further increase in basic capacity should be charged off as an emergency. Stated in simple terms, this undoubtedly means that the government will furnish the money to build the facilities for 10,000,000 tons of steel capacity on the premise that such an increase could hardly be needed in any peace time or normal year. Such a solution will go far, it is believed here, toward preventing an uneconomical steel situation after the present international warfare is over.

As pointed out in THE IRON AGE many times, civilian steel needs will be further curtailed and the latest orders from Washington, most important one of which is that steel sheet and strip commercial business must give way to plate and heavy sheet production for defense items, indicate fairly clearly the general trend toward steel allocation or mandatory priorities.

Unless the steel necessary to build the increased ingot capacity is taken from commercial users, it is quite definite that this program will, in itself, retard to a serious extent the national defense program. However, it is believed that current steps taken toward curtailment of commercial production of steel are merely a forerunner of more stringent measures to follow.

While no definite and formal statements have been issued by the steel industry that the 10,000,000 tons of steel capacity will be built, steel circles here believe

that the whole question is "cut and dried" and represents the final chapter in the capacity controversy which has veen raging for some time.

Great Lakes to Produce 300,000 Tons of Light Plates

• • • **A program to provide** an annual production of 300,000 net tons of light plates at the Ecorse plant of Great Lakes Steel Corporation, unit of National Steel Corp., is announced by George R. Fink, president.

Move is being taken to help speed the defense program, Mr. Fink said, and is designed to help overcome the current shortage in light plates which is proving a particular impediment in the construction of railroad cars and ships.

The program will involve changes and additions to the finishing department of the No. 2—96-in. hot strip mill as follows: The present 96 x ½ in. parting shear is to be replaced by a 96 x 1 in. parting shear. The piler at the end of the runout table will be increased to permit the piling of plates up to 30 ft. in length. Runout tables, kickoff and cradles for piling plate are to be installed at the end of one of the existing shearing lines.

A new shearing line, consisting of a charging car, lift table, trimmer, leveler, shear, plate kickoff, and piler, with the necessary roller tables between the units, will also be installed. To provide room for the new shearing line it will be necessary to extend the hot strip mill finishing building.

The new facilities will permit the rolling of plates up to 90 x ⅜ x 30 in. Actual rolling will be done on the 96-in. hot strip mill, which, although primarily designed for the rolling of strip sheets, will require no alteration. Maximum plate production will utilize approximately one-third of the normal capacity of the mill.

By combining present and new facilities it will be possible to start plate production at the Great Lakes plant within six months whereas at least 18 months would be required for the construction of an entirely new plate mill.

It is pointed out that this new source of supply for light plates will reduce the pressure on existing plate capacity for light material and allow plate mills to concentrate to a greater degree on the more efficient production of heavier plates which also are in urgent demand for defense purposes. Location of the plant in the Midwest will also make possible a saving in time, material and labor now consumed in transportation of material to plate fabricators in that area.

Steel Expansion Would Require 95 Open Hearths

Cleveland

• • • **Enlargement of the** nation's ingot capacity cannot be accomplished unless the program takes preference over other phases of the national defense plan.

Currently, it is difficult to obtain materials for the repair of existing steel mill equipment and for expansion projects announced late last year. An A-2 priority rating was satisfactory a few months ago but not today.

Around 17 new large blast furnaces would be required for 10,000,000 tons more ingot production per year. Even with the best priorities 15 to 18 months would elapse before completion of the stacks and even then the shipbuilding program would suffer through the necessity of diverting plates, motors, and other parts.

Around 95 stationary open hearths would be required and eight or nine months would be required for their construction from the design stage.

Hot metal cranes and other auxiliary equipment are difficult to obtain. On the job of expanding armor plate facilities at an eastern mill, with A-1-A priority, the best delivery promise on cranes was exactly one year.

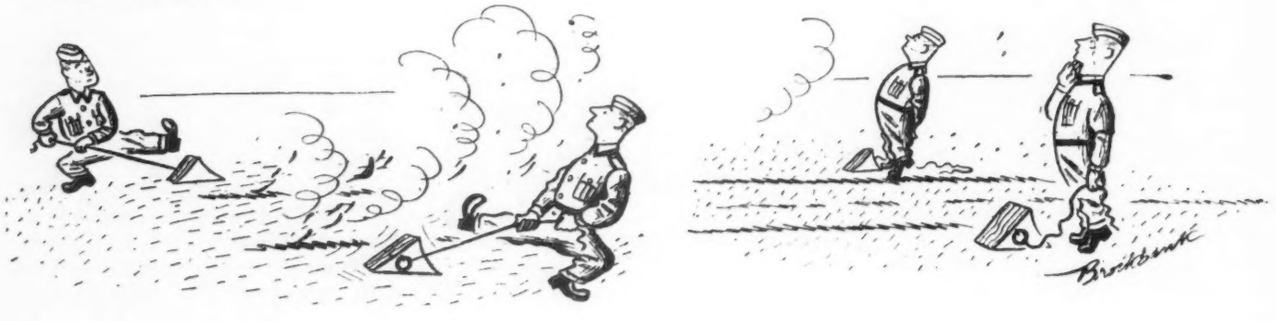
More blooming mills, coke ovens, coal mines, ore vessels and other items would be required and in order to construct them highest priorities would be needed.

Obtaining scrap presents another hurdle. Makers of ladles, fire brick and countless other parts would have all the work they could take care of.

Some of the priority ratings recently granted for seemingly nonessential projects, including work in foreign countries, might have to be rescinded.

Steel men here seem to be of the opinion that the nation better struggle along on what it has, plus moderate expansion, and above all to keep present facilities in good repair.

INVISIBLE BOMBER: Recent news dispatches from Berlin indicated that German industry is experimenting with "invisible" plastic planes. How the take-off of such a plane might appear is shown in this cartoon from *Aeroplane*, British aviation magazine.



Alloy Steel Output 4,966,000 Tons in '40

• • • **Production of alloy** steels in the United States during 1940, under the sharp impetus of the defense program and British demand, rose to a new peak of 4,966,000 net tons, according to the American Iron and Steel Institute.

The total output of alloy steels last year exceeded by nearly 60 per cent the 1939 production of 3,212,000 tons, and was 12 per cent above the previous peak of 4.432,-000 tons produced in 1929.

In 1918, alloy steel production in this country was 2,002,000 tons, or only two-fifths of the total tonnage of alloy steels produced by the industry last year.

For the most part, the alloy steels produced in such large tonnages last year are the same steels developed originally for peacetime purposes. At present they are essential in constructing most of the major items in the defense program, including airplanes, naval vessels, tanks, guns, defensive armor and certain projectiles.

Some alloy steels contain only one to two per cent of alloying elements, while others contain as much as 25 per cent or more of chromium, nickel or other alloying elements.

Alloy steel production in 1940, in addition to establishing a new record for tonnage, also amounted last year to a record-breaking proportion of total steel production.

Almost 7.3 per cent of the total steel ingot production of 66,650,000 tons last year was alloy steel ingots. By comparison, only 5.9 per cent of the ingot tonnage in 1939 was alloy steel.

Alloy steels constituted about 6.9 per cent of the 1929 steel ingot output, and exactly 4.0 per cent of the ingot production in 1918.

C-I May Expand Plate Mill at Homestead

Pittsburgh

• • • **Carnegie-Illinois Steel** Corp. has under active consideration a plan to enlarge the plate capacity of its Homestead plate mill by the addition of various types of finishing equipment. Action may be taken on this plan in the near future, the completion of which will step up considerably the production of plates on the Homestead 100 in. plate mill.

When the mill was first built, its potential capacity was somewhat above what was believed to be normal plate requirements at that time. Finishing equipment installed initially was sufficient to take care of the heaviest normal peacetime load. However, with national defense requirements demanding record tonnages of various types of plates, the company is now contemplating bringing the finishing equipment such as shears, straighteners, levelers, etc., up to the full capacity of the mill. While this mill was tentatively set at around 700,000 tons of plates a year, production records indicate that 1,000,-000 tons or more would be a more correct figure.

The reversing stands of the 100 in. mill were recently revamped so that heavy plate up to 120 in. wide could be processed at that point on the mill. Heavy deck plate is now being turned out in this fashion by utilizing the four-high reversing parts of the mill.

T. C. I. Prepares to Roll 140-in. Plates

Pittsburgh

• • • **By January, 1942,** U. S. Steel Corp. subsidiary, Tennessee Coal, Iron & Railroad Co. expects to have completed revamping of its plate mill department which will result in production of wide plates running close to 140 in. in width.

Contracts have been let for the construction of a four-high 140 in. wide single stand mill which will be added to the present three-high 110 in. single stand mill. With these two stands in tandem, the first stand will act as a breakdown mill for the 140 in. stand. Shearing lines and other finishing facilities are also part of the equipment now being built for the plate expansion at TCI.

In order to expedite the completion of this project so as to furnish all aid possible in national defense effort, orders for the mill equipment have been spread among several manufacturers.

40 Items Added to Priorities Critical List

Washington

• • • **The OPM Division** of Priorities on Monday added approximately 40 new items and classes of items to the priorities critical list. This list is a compilation of materials on orders for which the Army and Navy contracting officers may automatically assign preference rating certificates, thus assuring prompt delivery for military purposes. All metals except a few precious ones now are covered by the list.

Among the new items on the list are: aircraft laboratory and test equipment; heat treating electric furnaces; all types of addressing and duplicating machines, except aluminum, and plate making equipment; tractor drawn scrapers; tungsten carbide and gun turrets.

Products that are subject to industry-wide priority control by the Priorities Division include pig or fabricated aluminum and aluminum alloys; pig and fabricated copper; machine and metal working tools; alloy, pig and fabricated nickel; semi-finished; finished, fabricated and alloying steel.

The steel products are covered by a special order requiring preferential treatment of defense orders and permitting users to file a formal complaint of any inability to obtain delivery or place orders.

Sabotage Blamed for Fire At Wheeling Machine Works

Wheeling, West Va.

• • • **Sabotage is believed** to have been the cause of a $1,000,000 fire that ravaged the plant of Wheeling Machine Products Co. here Monday. The main plant building was completely destroyed and adjoining wings damaged.

"All company records and some almost irreplacable machines and tools were destroyed, entirely halting production," E. W. Krause, company president, reported. He added that 70 per cent of the company's output was of national defense nature.

In addition to turning out special fabricating equipment for Pittsburgh and Youngstown steel mills, the company is reported to have an order for shell casings.

Personals

Change is inevitable in progressive Industry. Change is constant.

• **A. F. Dohn,** formerly vice-president in charge of tool steel sales, Allegheny Ludlum Steel Corp., Pittsburgh, has retired from active business interests. He will, however, continue in a consulting capacity as a vice-president of the company. In a move to correlate more closely the production facilities of the two Allegheny Ludlum plants in the Pittsburgh district, at Brackenridge and West Leechburg, **Melvin C. Harris** has been appointed to the newly-created position of district manager. **George W. Evans** has been made general superintendent of the Brackenridge, Pa., plant and **Carl B. Pollock** has been appointed manager of this plant.

Mr. Dohn opened his own sales office in Buffalo in 1912 after having been employed with the Buffalo Engine Co. as sales manager and secretary-treasurer. In 1915 he joined the Atlas Steel Co., becoming vice-president in charge of sales in 1916 and president in 1924, continuing in that capacity until 1929 when his company merged with the former Ludlum Steel Co., when he became vice-president in charge of sales. Mr. Dohn held that position until the Allegheny Ludlum merger in 1938 when he assumed his recent status as vice-president in charge of tool steel sales for the corporation, with headquarters at the Watervliet, N. Y., plant.

Mr. Harris has had 26 years of service with Allegheny Ludlum, having started as a clerk in the plate mill in 1915. Upon his return from the war in 1919, he was made office manager of the plate mill and later the same year was transferred to the sales department. He became service manager in 1923. Mr. Harris was appointed assistant general manager of the Brackenridge plant a few years later, and in 1938, he was made general manager at Brackenridge.

Mr. Evans has been with the company since 1909. In 1912 he was transferred to open-hearth scrap inspection, which position he held until 1916 when he was transferred to the open hearth office to handle production and costs. After serving as general night superintendent from 1916 to 1918, Mr. Evans spent the next six years as general yard superintendent. In 1925, after six months as assistant superintendent of the bar and blooming mills, he was made superintendent of the department. In 1940 he was made assistant general superintendent of the Brackenridge plant.

Mr. Pollock, after serving in the Army, became associated with the U. S. Steel Corp. In 1920 he accepted the general managership of the Newton Steel Co. continuing in that capacity until 1930, when he became manager of the Follansbee Steel Corp.'s Toronto plant. In 1932 he joined the former Allegheny Steel Co. as superintendent of No. 2 department at Brackenridge. He subsequently became assistant general superintendent, general superintendent, and in the current move, manager of the Brackenridge plant.

• **Laurence M. Ewell** has been appointed general manager of eastern division operations, with headquarters in Philadelphia, of the Link-Belt Co. Mr. Ewell, who has until now been export manager, and manager of the company's New York office, will be succeeded in that position by his assistant, **Carl A. Woerwag,** with headquarters in New York as heretofore.

Mr. Ewell, a graduate of the Link-Belt engineering department, entered the employ of the company in Philadelphia in 1906, and advanced successively through the drafting and estimating departments. Later he was transferred to the sales department and has served as sales engineer and branch manager of Link-Belt offices in Philadelphia, Chicago, St. Louis, and New York.

Carl Woerwag entered the employ of the company at Philadelphia in 1910, in the drafting room. In 1914 he became squad engineer in charge of boiler plant and gas house conveyor work. He left

Allegheny Ludlum Promotes

A. F. DOHN, formerly vice-president in charge of tool steel sales, who has retired but continues in a consulting capacity.

MELVIN C. HARRIS, district manager of plants in Pittsburgh district.

Link-Belt in 1917 and became an ordnance inspector in the U. S. Army, returning to the company in 1919, as sales engineer in the export department, with headquarters at the New York office.

• **Howard F. MacMillin,** president and general manager of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, was the guest of honor at a testimonial dinner given recently at the Hotel Harding, Marion, Ohio, by a group of 30 of his close business associates.

• **Norman L. Deuble,** formerly assistant to vice-president, Copperweld Steel Co., Warren, Ohio, has been appointed manager of sales. Mr. Deuble is a graduate of the Case School of Applied Science with the degrees of B. S. and Metallurgical Engineer. Mr. Deuble was with Republic Steel Corp., Central Alloy Co., and United Alloy Steel Co. before joining Copperweld.

NORMAN L. DEUBLE, new manager of sales of Copperweld Steel Co.

• **H. E. Doughty** has been appointed manager of the recently established Philadelphia branch of Jessop Steel Co., Washington, Pa.

• **A. W. Parker,** after 54 years of continuous service with the Worthington Pump & Machinery Corp., Harrison, N. J., has retired. He joined the company as a draftsman and has served in the engineering and advertising departments of the company.

Operating Personnel

GEORGE W. EVANS, general superintendent of Brackenridge plant.

CARL B. POLLOCK, manager of Brackenridge plant.

• **E. J. Hergenroether,** metallurgist of the Detroit field office of the development and research division of the International Nickel Co., Inc., has resigned to join the staff of the conservation section, production division of the OPM.

• **James H. Maguire** has retired as works manager of the Kokomo plant of the Haynes Stellite Co., a unit of Union Carbide & Carbon Corp. He will continue in a consulting capacity. **F. T. McCurdy** becomes general superintendent in charge of production and operating departments, after having served since 1929 as superintendent of the plant. **J. R. Brown,** formerly production manager, will be assistant superintendent. **H. C. Fretz,** formerly general foundry foreman, as assistant to the superintendent, will be in charge of foundries.

• **Lloyd L. Lee,** formerly with the Wilcox-Rich division, Eaton Mfg. Co., has been elected vice-president of the Gordon-R-Co., Royal Oak, Mich. He will have charge of sales and engineering.

• **Alva Edison Radcliffe,** for the past 15 years identified with the Chicago office of the Edison Storage Battery division, Thomas A. Edison, Inc., has been named Cleveland district manager, succeeding the late Peter R. Nelson.

• **Bert Cook** has been appointed factory manager of the Nicholson File Co. plant in Indianapolis. He succeeds the late William H. Morsches. Mr. Cook was advanced from the post of plant superintendent.

• **James E. De Long,** president of the Waukesha Motor Co., Waukesha, Wis., was officially appointed assistant chief of the Chicago ordnance district by Col. Donald Armstrong, executive officer of the district, at a luncheon given for Mr. De Long by the officers of the district. Mr. De Long succeeds the late C. R. Messinger, former head of Chain Belt Co.

• **George C. White,** with the Belknap Hardware & Mfg. Co., Louisville, Ky., since 1916, and **Berl Boyd,** with the company since 1922, have been elected directors of the company.

• **Willis J. Stoddard,** who has been associated with the Pennsalt

cleaner division of the Pennsylvania Salt Mfg. Co., has been appointed sales representative in the territory including Columbus, Cincinnati, Dayton, and Indianapolis. He will make his headquarters in Dayton.

• **Norman D. Carpenter** has been appointed district sales manager of the Weirton office territory of Weirton Steel Co., succeeding the late Louis T. Lott.

• **Walter L. Rice** has been appointed vice-president of Reynolds Metals Co., Richmond, Va. He was formerly special assistant to the Attorney General of the United States.

Batt on Apprentice Board

Washington

• • • **William L. Batt,** president of SKF Industries, Philadelphia, and chief aide to John D. Biggers, director of the OPM Production Division, has been appointed an employer member of the Federal Committee on Apprenticeship by Secretary of Labor Frances Perkins. Mr. Batt replaces Ralph E. Flanders, president of the Jones & Lamson Machine Co., who retired from the committee because of mounting defense production at his plant.

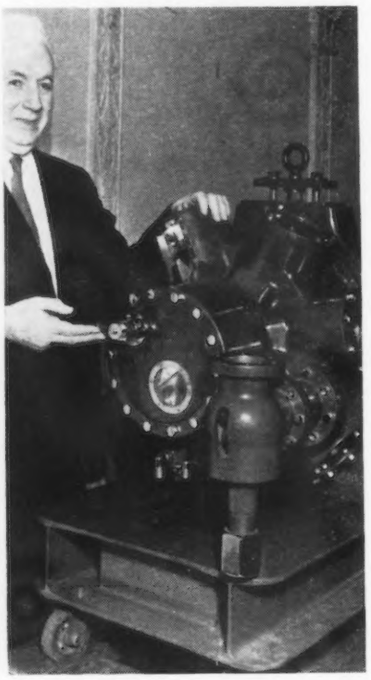
Created to review national apprenticeship activities and make recommenedations, the Federal Committee on Apprenticeship comprises seven members, two representating management, two labor and the others interested government agencies.

Chrysler Prices Lifted

Detroit

• • • **Public announcement** has been made of price increases on two lines of cars produced by divisions of the Chrysler organization. Detroit delivered prices for Plymouth cars were increased last week from $10 to $37 on various models, according to D. S. Eddins, president of Plymouth. At the same time, J. B. Wagstaff, general sales manager of the De Soto division, announced increases of $15 to $47 on various models of the De Soto.

In recent weeks the price of Ford cars has been increased $15—and this was the start of a general price rise in the industry.



CHARLES R. NEESON, director of cooling research for Airtemp, explained the operation and construction of the Airtemp radial compressor, which he designed, at the clinic staged by Airtemp on June 5 at Dayton.

Airtemp Holds Clinic On Air Conditioning

Dayton

• • • **The attention of nearly** fifty editors of trade and business papers was focused on varied phases of air conditioning for industrial, commercial and domestic use at a day-long round table clinic staged here June 5 by the Airtemp Division of Chrysler Corp. The meeting, first of its kind ever held in the air conditioning industry, was called by D. W. Russell, president of Airtemp. Discussions and suggestions advanced by participants will be compiled to form a permanent record of this symposium, he stated.

In opening the session, Mr. Russell declared that the auto industry formula of research and economical mass production is being undertaken by Airtemp to make air conditioning available to millions. This formula will put year-round air conditioning within the reach of every small business and even homes of modest cost, he said.

Industrially, it was pointed out, the advantages of factory air conditioning include seven features: Aids in maintaining close tolerances; assists in making accurate measurements; keeps out dust and dirt; prevents corrosion; eliminates errors (due to operator fatigue and tension); promotes employee goodwill, and increases employee efficiency in hot, humid weather. "Packaged" air conditioning units, suitable for easy installation in smaller industrial plants, were displayed in operation in the ballroom of the Biltmore Hotel, where the clinic was held.

Various contributors to the discussions stated that the air conditioning industry was making valuable contributions to the defense program, partly in the control of temperature and humidity in defense factories. They also portrayed the industry as playing an important and vital role in post-emergency recovery. Summing up this viewpoint, Russell declared:

"This is a new giant basic industry in the making. There is not much question of its value in the defense program. And it can aid us in the post-war period. It is our desire through this air conditioning round table and clinic to make a contribution to the industry and establish a dependable source of information to all the industry."

At luncheon, Merle Thorp, editor, *Nation's Business,* addressed the assembled editors and a group of Dayton business executives on "Air Conditioning — An Aid to American Industry."

Compressed Gas Fuel For U.S. War Planes

Cleveland

• • • **Gas compressed under tremendous pressure and carried in small fuel containers may prove a boon to the United States aircraft program, as it would greatly lighten the plane load. The process has been developed successfully here, using a multi-cycle compressor, and problems of adapting aircraft are being attacked.**

May Pig Iron Production Increased By 2.7 Per Cent

PRODUCTION of coke pig iron in May totaled 4,599,966 net tons compared with 4,334,267 tons in April. Output on a daily basis last month showed a gain of 2.7 per cent over that in April, or from 144,475 tons to 148,386 tons a day in May. The operating rate for the industry was 93.8 per cent of capacity in May, compared with 91.8 per cent in April.

On June 1 there were 206 furnaces in blast, one more than the 205 in operation on April 1 before the coal strike, compared with 195 in blast on May 1. The United States Steel Corp. blew in seven furnaces during May, independent producers put four in blast and took two off blast and two merchant furnaces were blown in, making a net gain of 11 furnaces.

Among the furnaces blown in were: Two Carrie, one Ohio, one Chicago (new) and one Gary, Carnegie-Illinois Steel Corp.; one Lorain, National Tube Co., and one Fairfield, Tennessee, Coal, Iron & Railroad Co.; one Susquehanna, National Steel Corp.; one Harriet, Wickwire-Spencer Steel Corp.; one Monessen, Pittsburgh Steel Co.; one Mary, Sharon Steel Hoop Co.; one Shenango, Shenango Furnace Co., and one River, Republic Steel Corp.

Furnaces blown out or banked included: One Cambria, Bethlehem Steel Co., and one Detroit, National Steel Corp.

Production of Coke Pig Iron and Ferromanganese

	Pig Iron*		Ferro-Mn†	
	1941	1940	1941	1940
January	4,663,695	4,032,022	35,337	43,240
February	4,197,872	3,311,480	33,627	38,720
March	4,704,135	3,270,499	55,460	46,260
April	4,334,267	3,137,019	56,871	43,384
May	4,599,966	3,513,683	58,578	44,973
June	.....	3,818,897	.....	44,631
½ year	.....	21,083,600	.....	261,208
July	.....	4,053,945	.....	43,341
August	.....	4,238,041	.....	37,003
September	.....	4,176,527	.....	33,024
October	.....	4,445,961	.....	32,270
November	.....	4,403,230	.....	31,155
December	.....	4,547,602	.....	35,666
Year	.....	46,948,906	.....	473,667

*These totals do not include charcoal pig iron. †Included in pig iron figures.

Daily Average Production of Coke Pig Iron

	1941	Per Cent Capacity	1940	Per Cent Capacity
January	150,441	95.5*	130,061	85.8
February	149,924	95.2	114,189	75.1
March	151,745	96.9	105,500	68.9
April	144,475†	91.8†	104,567	68.6
May	148,386	93.8	113,345	74.8
June	.....	...	127,297	83.9
½ year	.....	...	115,844	76.1
July	.....	...	130,772	86.3
August	.....	...	136,711	90.4
September	.....	...	139,218	92.2
October	.....	...	143,418	94.8
November	.....	...	146,774	97.1
December	.....	...	146,697	97.2
Year	.....	...	128,276	84.6

*Revised for capacity as of Dec. 31, 1940. †Revised.

Merchant Iron Made, Daily Rate

	1941	1940	1939
January	20,812	16,475	11,875
February	21,254	14,773	10,793
March	23,069	11,760	10,025
April	20,434	13,656	9,529
May	21,235	16,521	7,883
June	.....	13,662	8,527
July	.....	16,619	9,404
August	.....	17,395	11,225
September	.....	17,571	12,648
October	.....	18,694	16,409
November	.....	22,792	16,642
December	.....	19,778	16,912

Production by Districts and Coke Furnaces in Blast (In Net Tons)

	May, 1941	Daily % of Capacity	April, 1941	Daily % of Capacity*	May, 1940	June 1, 1941 No. in Blast	June 1, 1941 Operating Rate	May 1, 1941 No. in Blast	May 1, 1941 Operating Rate
Eastern	32,056	87.7	35,535	100.3	.....	2	1,035	2	1,185
Buffalo	265,702	87.3	266,306	90.5	211,692	14	9,055	12	8,875
Philadelphia	389,505	84.2	383,263	89.6	370,684	16	12,565	16	12,470
Ferro. and Spiegel	17,653	107.3	16,904	106.2	11,038	4	570	4	565
Pittsburgh	1,087,289	91.3	1,035,357	89.8	843,028	45	35,890	43	33,440
Ferro. and Spiegel	35,597	82.1	34,372	81.9	27,286	4	1,150	4	1,145
South Ohio River	98,777	90.6	94,516	89.6	84,133	7	3,185	7	3,150
Valleys	516,134	88.4	519,568	92.0	390,797	22	17,300	19	15,270
Wheeling	218,434	106.4	201,274	101.3	172,051	9	7,045	9	7,120
Cleveland	413,427	101.3	369,281	93.5	256,882	17	14,105	15	11,160
Chicago	1,022,746	96.6	931,378	90.9	686,501	39	33,455	37	31,045
St. Louis	.....	...	.....	...	.....	0	.....	0	.....
Detroit	118,955	102.4	93,939	83.6	109,207	4	3,035	5	3,130
Western	67,702	107.6	67,730	111.3	64,060	4	2,185	4	2,260
Southern	310,660	104.2	279,269	96.9	274,776	17	10,370	16	9,310
Ferromanganese	5,328	57.3	5,595	62.4	11,548	2	55	2	185
Total	4,599,966	93.8	4,334,267	91.8	3,513,683	206	151,000	195	140,310

*Revised.

Hartley Wire to Produce Special Carboloy Dies

• • • **A 100 per cent increase** in factory floor space to accommodate new equipment for the production of Carboloy shape and other special dies is announced by Hartley Wire Die Co., Thomaston, Conn. The expansion, according to E. W. Hartley, president, permits production of all types of special Carboloy dies including those used in the manufacture of bullets, shells, and other armament parts, in addition to carbide wire drawing dies normally produced by the company.

Production of the new dies will be under the supervision of Anton Berg, formerly a supervisor in the Carboloy Co. Under the arrangements, the Hartley company will perform all the processing necessary on the special dies which it will produce, with the exception of the manufacture of the cored nibs, which will be supplied to Hartley by the Carboloy Co.

The Iron Age Comparison of Prices

Advances Over Past Week in Heavy Type; Declines in Italics

	June 10, 1941	June 2, 1941	May 13, 1941	June 11, 1940
Flat Rolled Steel:				
(Cents Per Lb.)				
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Tin and Terne Plate:				
(Dollars Per Base Box)				
Tin plate	$5.00	$5.00	$5.00	$5.00
Manufacturing ternes	4.30	4.30	4.30	4.30
Bars and Shapes:				
(Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Wire and Wire Products:				
(Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails:				
(Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel:				
(Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Wire Rods and Skelp:				
(Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

	June 10, 1941	June 2, 1941	May 13, 1941	June 11, 1940
Pig Iron:				
(Per Gross Ton)				
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$24.84
No. 2, Valley furnace	24.00	24.00	24.00	23.00
No. 2, Southern Cin'ti	24.06	24.06	24.06	23.06
No. 2, Birmingham	20.38	20.38	20.38	19.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	23.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	24.34
Basic, Valley furnace	23.50	23.50	23.50	22.50
Malleable, Chicago†	24.00	24.00	24.00	23.00
Malleable, Valley	24.00	24.00	24.00	23.00
L. S. charcoal, Chicago	31.34	31.34	31.34	30.34
Ferromanganese‡	120.00	120.00	120.00	100.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton. ‡For carlots at seaboard.

Scrap:				
(Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.25
Heavy melt'g steel, Phila.	18.75	18.75	18.75	19.50
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	17.75
Carwheels, Chicago	....	....	....	19.00
Carwheels, Philadelphia	....	....	....	20.75
No. 1 cast, Pittsburgh	22.00	22.00	22.00	20.25
No. 1 cast, Philadelphia	24.00	24.00	24.00	20.75
No. 1 cast, Ch'go*	21.00	21.00	21.00	17.00

*Changed to gross ton basis.

Coke, Connellsville:				
(Per Net Ton at Oven)				
Furnace coke, prompt	$6.125	$6.125	$6.125	$4.00
Foundry coke, prompt	6.875	6.875	6.875	5.25
Non-Ferrous Metals:				
(Cents per Lb. to Large Buyers)				
Copper, electro., Conn.*	12.00	12.00	12.00	11.50
Copper, Lake, New York	12.00	12.00	12.00	11.50
Tin (Straits), New York	53.00	52.25	52.25	57.00
Zinc, East St. Louis	7.25	7.25	7.25	6.25
Lead, St. Louis	5.70	5.70	5.70	4.85
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

*Mine producers only.

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 136-142 herein.
On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

Composite Prices

	FINISHED STEEL	PIG IRON	SCRAP STEEL
June 10, 1941	2.261c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.261c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.261c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.261c. a Lb.	$22.61 a Gross Ton	$19.17 a Gross Ton

	High	Low	High	Low	High	Low
1941			$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.261c., Jan. 2	2.211c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.286c., Jan. 3	2.236c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.512c., May 17	2.211c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.236c., May 28	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Summary of the Week

• Commercial steel shipments, particularly sheet mill products, being sharply curtailed by preference order . . . Five or six companies will undertake 10,000,000-ton expansion program . . . Scrap scarcity complicates steel situation . . . Ceiling prices to be named on pig iron.

SHARP curtailment of steel shipments to non-defense users and distributers has gone into effect as a result of the issuance of the steel preference order of May 29 by the Office of Production Management.

Although probably not more than 40 per cent of the steel orders on steel companies' books are clearly identifiable as direct defense business, there is a considerable additional volume for indirect defense for which preference ratings will be issued.

The allocation of 469,420 tons of steel, mostly plates, for ships by the OPM, the granting by OPACS of preferences on railroad steel over all other non-defense requirements and the probability that the OPM will soon allocate 850,000 tons of steel for oil pipe lines, together with the fact that most of this steel is scheduled for early delivery, point clearly to the displacement of a good deal of commercial steel business now on the books. Sheet and strip users generally who have no claim to preference ratings will be first to feel the effects of curtailed shipments. Shipments to some warehouse distributers have already been cut down materially.

TWO significant developments have followed the issuance of the steel preference order. One is a scramble among manufacturers to obtain defense work and the other is the redesigning of some consumer products so that plastics and other materials can be substituted for steel.

The steel industry's distribution problem has not been solved, but in fact has been more seriously complicated by the preference order. Whatever steel is left after priority orders are satisfied can be distributed among each company's regular customers, but the total amount thus remaining is not going to be sufficient to supply all commercial requirements. The problem of dividing up such tonnage is one which admits of no satisfactory solution. Shipments of steel to non-defense consumers are now estimated to be less than consumption, with the result that inventories are being reduced and curtailment of some manufacturing operations will inevitably result.

THE recommendation of the Office of Production Management for an increase of 10,000,000 tons in the annual capacity of the steel industry was a surprising development in the light of the Gano Dunn report that such an expansion would require 4,160,000 tons of ingots and take two years to complete. However, preliminary plans have been worked out for such an expansion. Probably not more than five or six companies will participate in the program, the tentative allotment of capacity additions being as follows: United States Steel Corp., 3,200,000 tons; Bethlehem Steel Co., 1,800,000 tons; Republic Steel Corp., 1,400,000 tons, the remainder to be divided among the Jones & Laughlin Steel Corp., the National Steel Corp., and the American Rolling Mill Co. About 95 open hearth furnaces and from 17 to 20 new blast furnaces would be required. Additions to the Great Lakes ore fleet would also be a part of the program.

Steps have been taken by the OPM toward the alteration of continuous sheet-strip mills so that they can produce wider and thicker plates for ships and railroad equipment. Freight cars now on order will require about 1,400,000 tons of steel over the remainder of the year and further additions to car orders are in prospect, particularly tank cars to relieve the oil transportation problem. Orders placed in the past week totaled 10,275 freight cars and 30 locomotives, with inquiries for 5500 cars pending.

COMPLICATING the steel supply situation is the growing shortage of scrap. An Eastern mill may be forced to shut down some open hearths this week unless its supply is augmented. Meanwhile, the Treasury Department will soon allocate orders for 280,000 tons of scrap to be shipped to Great Britain, also orders for 1,000,000 tons of steel and 240,000 tons of pig iron.

Ceiling prices for pig iron may be announced shortly by the Office of Price Administration and Civilian Supply. There is a growing shortage of pig iron despite high production. On June 1 the number of furnaces in blast was 206, one more than on March 1, the previous high point of this year, and the greatest number since June 1, 1929, when the 219 then in blast were making less iron than 206 are now.

Ingot production this week is estimated at 100 per cent. The American Iron and Steel Institute's estimate this week was 98.6 per cent, but with the withdrawal of the National Steel Corp. from membership the Institute now reports only 92.91 per cent of the open hearth capacity compared with 98.26 per cent previously.

OPACS has permitted the Granite City Steel Co. to charge 2.25c. a lb. for plates, $3 a ton above the "frozen" price.

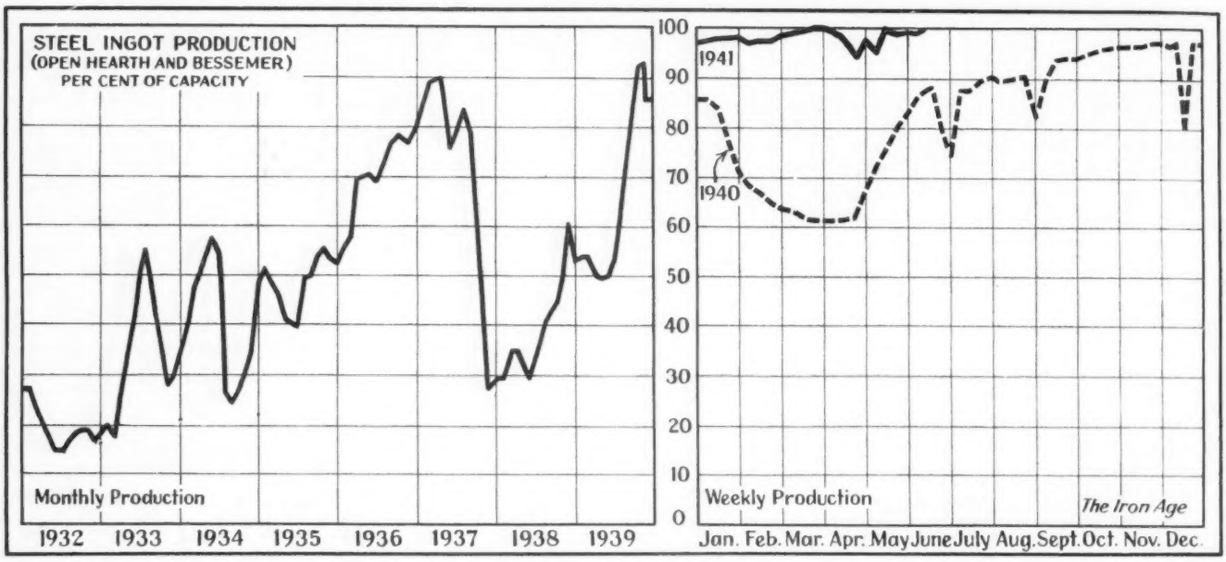
The Industrial Pace . . .

Output of the durable goods industries in the past week more than recovered to the pre-holiday level. Physical output of many industries, including steel and automobiles, showed increases above the level holding prior to Memorial Day. This quick snapback from the holiday slow down was reflected in a rise of 2.8 points in THE IRON AGE capital goods index last week, bringing the index to 115.7 per cent of the base years.

All five components of the index participated in this rise, with especially sharp gains recorded in the steel, automobile and construction series. While the bulk of the week's increases was due to higher physical output, adjustment of these advances against the generally declining seasonal trends prevailing at this time, is tending to accelerate the index's upward movement.

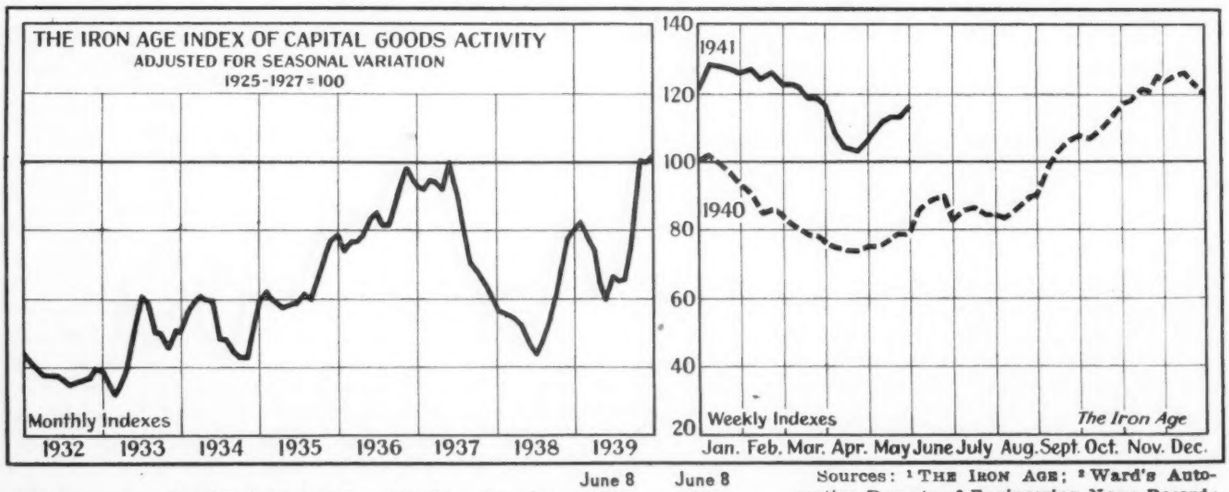
Possibility that a second wave of new plant construction is approaching, an outgrowth of the Lease-Lend Act, is suggested by the sharp rise in the volume of heavy engineering construction awards placed in the past week. The week's volume, $132,570,000, was the fifth highest week of the current year and double the total of the holiday week.

Steel Production Hits 100% Again



District Ingot Production, Per Cent of Capacity		Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Buffalo	Wheel-ing	Detroit	Southern	S. Ohio River	West-ern	St. Louis	East-ern	Aggre-gate
	Current Week ..	101.0	102.0	99.0	97.0	98.0	104.5	85.0	105.5	95.0	106.0	102.5	111.0	95.5	100.0
	Previous Week..	101.0	100.5	99.0	97.0	95.0	106.0	85.0	109.0	99.0	102.0	102.5	111.0	95.5	99.5

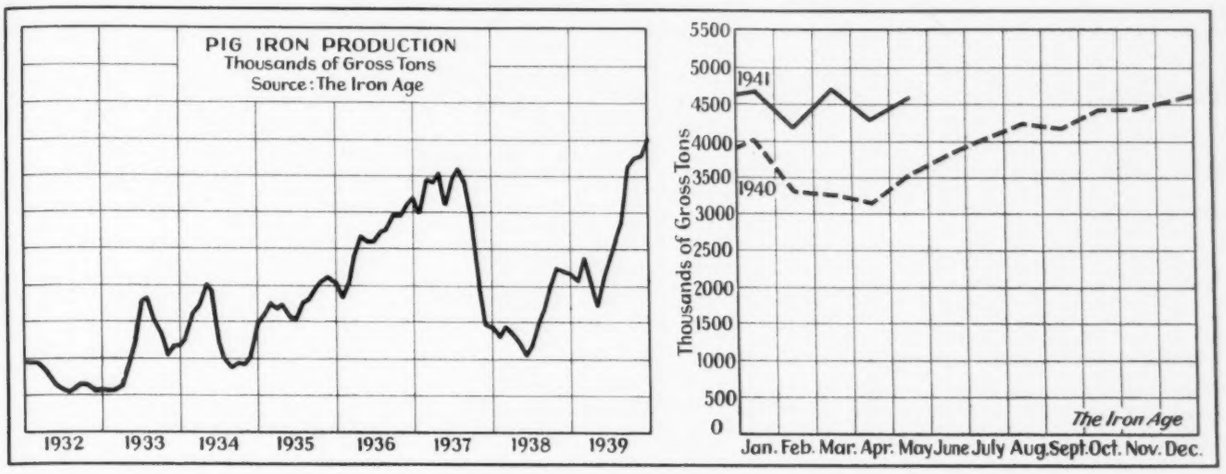
All Components of Index Advance



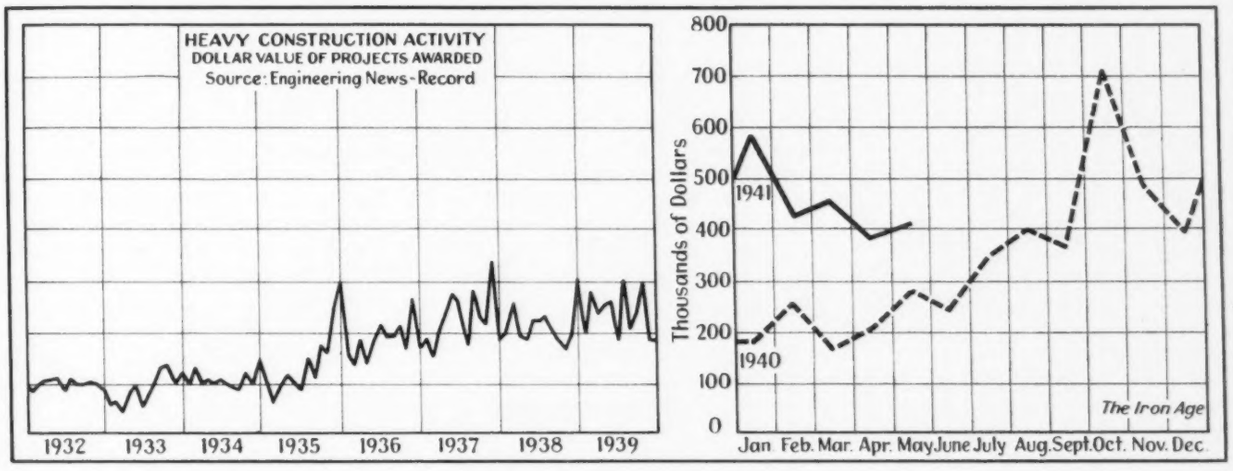
Component ▼ Week Ended ➤	June 7	May 31	May 10	June 8 1940	June 8 1929
Steel ingot production[1]	140.1	136.8	130.7	111.3	135.7
Automobile production[2]	118.1	115.5	110.7	84.4	127.9
Construction contracts[3]	111.3	109.2	121.2	65.0	128.0
Forest products carloadings[4]	77.4	73.9	75.3	63.6	113.6
Pittsburgh output and shipments[5]	131.4	129.3	109.1	98.2	127.7
COMBINED INDEX	115.7	112.9	109.4	84.5	126.4

Sources: [1] THE IRON AGE; [2] Ward's Automotive Reports; [3] *Engineering News-Record*; [4] Association of American Railroads; [5] University of Pittsburgh. Indexes of forest products carloadings and activity in Pittsburgh area reflect conditions as of week ended April 26. Other indexes cover week of May 3.

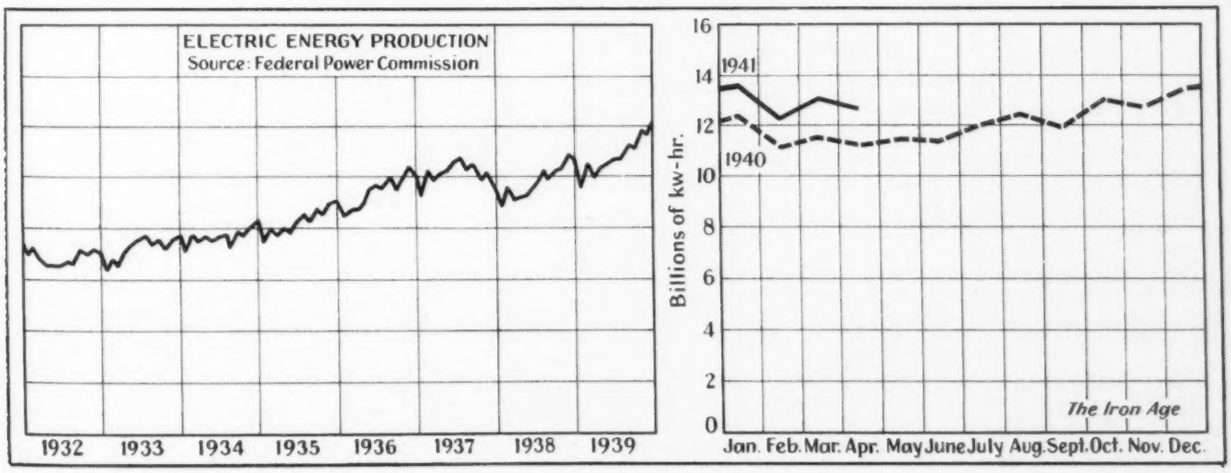
May Pig Iron Production at 93.8%



Heavy Construction Gains in May



April Power Output Declines



Market News

. . . THE WEEK'S ACTIVITIES IN IRON AND STEEL

New Business

. . . General preference order of May 29 now controls situation

Conduct of steel business, the taking of new orders and the shipment of orders on the books are now subject to the provisions of the General Steel Preference Delivery Order No. 1, issued May 29 by OPM.

Nearly all steel companies are engaged in revising their production and shipping schedule to meet the requirements of the new situation. An order issued Monday by Price Administration Leon Henderson, who has charge of distribution of steel and other materials to non-defense consumers, gives steel for railroads first call over all other civilian industries. This will further complicate the delivery situation, so far as commercial users are concerned, particularly in plates, sheets and strip.

Acting under the provisions of the steel preference delivery order, OPACS has announced the formula to be used in the allocation of iron and steel products among competing civilian demands after military defense requirements are satisfied. Leon Henderson laid down six factors which he said would be considered in making the allocations.

These factors will be weighed by Mr. Henderson:

1. The need to provide adequately for civilian uses esential to the public welfare;

2. The degree of hardship upon labor or business resulting from the failure to obtain deliveries when scheduled or from the rejection of orders;

3. The past rates of consumption of the products by users thereof.

4. The objective of achieving an equitable division of supplies of the products among all users.

5. The availability of substitutes for the particular uses for which the products are sought.

6. The policy of the Administrator to refuse allocation to any person who, in the conduct of his business, discriminates against defense needs.

Instituting a system of allocation, the OPM last Friday announced the distribution of 469,420 tons of steel among 15 producing companies in such a way as to assure the earliest deliveries. All of the steel, except 20,120 tons of plates for the British Iron & Steel Corp. and 6910 tons of tin plate for the British Purchasing Commission, is for American naval and merchant ship construction. The plates for the British went to the Central Iron & Steel Co., Harrisburg, and are for cargo vessels to be built in Canada.

Of the total allocation, plates constituted 323,990 tons and shapes, 136,400 tons. The largest allocation went to the Carnegie-Illinois Steel Corp., which was awarded 148,400 tons comprising 107,000 tons of plates and 41,400 tons of shapes. Allocations to the Bethlehem Steel Co. totaled 115,000 tons, including 81,000 tons of plates and 34,000 tons of shapes. The Worth Steel Co., took 80,000 tons of plates and the Lukens Steel Co. was allocated 52,000 tons of plates.

Preference ratings on steel and other materials for the construction and repair of freight cars were promulgated on Monday, with the statement that completion this year of all freight cars on order May 1 would require around 1,400,000 tons of steel.

This action was taken by Price Administrator Leon Henderson and was a source of surprise since it long has been known that OPM was about to issue preference rat-

OPM Allocates 469,200 Tons of Ship Steel

	Luken Steel	Alan Wood	Inland Steel	Otis Steel	Worth Steel	Bethlehem	Wierton	Jones & Laughlin	Carnegie-Illinois	Phoenix Iron Co.	Colorado Fuel & Iron	Central Iron & Steel
Consolidated Steel Corp. Cargo ships for Maritime Commission		3.000	3.000	3.320		1.600*	1.000*	800***				
Moore Dry Dock Co., Oakland, Cal. Cargo ships for Maritime Commission			1.000* 16.000				1.000*	7.600	4.000* 10.000	2.000*	1.000*	
New York Shipbuilding Corp., Camden, N. J. Naval vessels	12.000				5.000	5.000* 13.300			5.900* 12.000			
Dravo Corp., Pittsburgh Naval vessels								584.3**				
Commercial Iron Works, Portland, Ore. Naval vessels			517.5** 369.4									
Sun Ship. & Dry Dock Co., Chester, Pa. Tankers for Maritime Commission	40.000				75.000	68.000 32.400*			85.000 32.400			
British Iron & Steel Corp. Cargo ships to be built in Canada												20.120
Meseck Towing Lines, Inc., New York Navy tugs										120 100***		530

* shapes ** sheets *** bars

ings for car construction. Mr. Henderson said that the action, which was called a civilian allocation program, was taken under authority of *OPACS* to allocate residual supplies of scarce materials among competing civilian demands after needs of the armament program are satisfied.

Railroad Buying

. . . 10,000 freight cards ordered

Purchases during the past week total 10,275 freight cars and 30 locomotives, while inquiries for some 5500 cars were made known. Revisions indicate that 26,334 freight cars were awarded in May instead of the 23,705 reported in THE IRON AGE last week. The new total for the first five months of this year stands at 70,222 freight cars.

The suggestion in some quarters that railroads will use wood in the building of box cars apparently overlooks the fact that railroads are having a difficult time even obtaining lumber for steel sheathed box cars and also the fact that in recent years from a safety standpoint the use of wood in freight cars has been held to an absolute minimum. Some steel makers already setting up schedules in line with the preference ordered for railroad steel.

Northern Pacific ordered 1500 box and 200 ballast cars from American Car & Foundry Co. and 500 box cars from Pullman-Standard Car Mfg. Co.

Reading Co. is contemplating the purchase of 12,000 tons of rails and, in addition to 1500 freight cars to be built in company's shops, Bethlehem will make 500 box cars for this road.

Wabash has been authorized to buy two 660-hp. diesel switching locomotives and the materials to build 1000 50-ton box cars in own shops, 15 70-ton cement cars were bought from General American Tank Car Corp.

Norfolk & Western placed orders for 1000 70-ton hoppers with Virginia Bridge Co. and for 500 with Bethlehem.

Lehigh Valley bought 500 gondolas from Bethlehem, 400 box cars from Pressed Steel Car Co. and 500 auto-box cars from American Car & Foundry.

Gulf, Mobile & Ohio is taking 850 box and 150 hopper cars from American Car & Foundry. The same maker is to supply Maine Central with 10 70-ton hoppers and Delaware & Hudson with 35 container cars.

Rock Island bought 800 box cars from Pressed Steel.

Western Maryland has placed 200 box cars with Pressed Steel, 300 hoppers with Bethlehem and 200 gondolas and 25 flat cars with Greenville Steel Car Co.

Erie purchased five 90-ton heavy duty flat cars from Greenville.

New York Central is placing 15 4-8-2 freight locomotives with American Locomotive Co., while New York, Chicago & St. Louis is taking 15 2-8-4 engines from Lima Locomotive Works.

Chicago Rapid Transit Co. is inquiring for four three-compartment articulated units for test service to be followed by an order for 250 similar units. Other inquiries include Seaboard Airline with 1250 cars and Clinchfield with 10 4-6-6-4 locomotives. Burlington will acquire 4425 freight cars in its 1942 program, to be built in the Galesburg, Ill., and Havelock, Neb., shops for the Colorado & Southern and the Ft. Worth & Denver City.

Steel Operations

. . . Rate for industry again at 100 per cent, up half a point

The average rate of steel ingot production this week is 100 per cent, up half a point from last week. There have been increases in the CHICAGO, CLEVELAND and SOUTHERN OHIO districts and losses at BUFFALO, BIRMINGHAM and DETROIT. Seven of the 13 districts listed by THE IRON AGE are operating at above 100 per cent.

With the withdrawal of the National Steel Corp. from membership in the American Iron and Steel Institute, the institute estimates now cover only 92.91 per cent of the open hearth capacity of the country as compared with 98.26 per cent previously. This may partly account for the fact that the Institute this week estimated ingot production at only 98.6 per cent of capacity, a rate lower than that estimated by THE IRON AGE.

The Institute report of ingot production for May also covers only 92.91 per cent of total capacity and therefore does not make for a perfect comparison with the previous high total attained in March, before the soft coal strike.

An Eastern steel plant may be forced to shut down some open hearth furnaces next week unless a supply of scrap is received in the meantime.

Semi-Finished Steel

. . . Non-defense material to be progressively curtailed

Semi-finished material scheduled for non-defense products will be progressively curtailed as large allotments for ship plates, car plates, and other urgent defense products are made.

Pig Iron

. . . Ceiling prices to be announced soon . . . Scarcity grows more serious

Ceiling prices for pig iron probably will be announced this week by the Office of Price Administration and Civilian Supply. This and the growing scarcity of pig iron are high spots of the current situation. Although pig iron comes under the general preference order issued May 29, the effects on distribution of iron have not yet been experienced to the extent that is apparent in steel products.

Expansion of pig iron capacity will be a part of the steel expansion program recommended by the Office of Production Management. More Great Lakes ore carriers will have to be built to bring down the additional ore that will be required.

CLEVELAND reports that possibilities of an enlargement program on one of the stacks at the Lorain plant of National Tube Co. are good. Meanwhile, chief interest centers on the proposed expansion of steel making capacity which might require 17 to 20 new stacks which presumably would be located either in the Great Lakes or Southern areas, close to raw material sources.

Obtaining steel and other materials for some of the new stacks projected last fall has been difficult, and it would seem imperative that if the big program now being talked about is to go forward, highest priorities would be necessary.

At YOUNGSTOWN two idle stacks

were expected to resume production this week—a Republic stack and a Shenango furnace at Sharpsville. The repaired Sheet & Tube stack at the Campbell works went into blast as scheduled last week. Before the end of this week the YOUNGSTOWN district probably will be producing more iron than ever before in history. The 25 stacks in operation will be numerically inferior to the number active during the World War, but their aggregate capacity is larger.

Repairs to No. 2 blast furnace at the Hanna Furnace Co. plant at Buffalo have been completed and the stack probably will be lighted the end of the week. When this furnace is producing all 14 blast stacks in the Buffalo area will be operating for the first time in at least 12 years.

The pig iron supply situation in EASTERN PENNSYLVANIA is growing progressively more difficult both for non-integrated steel mills and foundries. Some foundries are working with only a few days supply on hand while production at least one steel mill is seriously threatened unless iron shipments are immediately stepped up. In several instances recently, pleas from foundries working on defense orders have resulted in diverting sufficient tonnages to avoid a shutdown, but this can only be done at the expense of other consumers. Defense officials are studying this problem and some action is expected shortly to prevent shutdown of plants with defense orders. With all blast furnaces operating at capacity, little prospect of relief is in sight, hence the inevitable conclusion is that sharp curtailment of iron shipments for civilian use is very close at hand. Use of few remaining idle furnaces would not materially affect the situation.

Prices

. . . Granite City permitted to charge 2.25c. for plates

The Office of Price Administration and Civilian Supply has authorized the Granite City Steel Co., Granite City, Ill., to maintain a mill price of 2.25c. base, on plates. The company has been allocated plate tonnage for delivery to the Pacific Coast, where the plate price is 2.65c. on cars, which with a 2½c. switching rate makes a delivered cost of 2.67½c. The commercial rail rate on plates from Granite City to the Pacific Coast is $1.05 per 100 lb. The "frozen" plate price is 2.10c.

A final conference of some 25 steel works and merchant producers with OPACS will be held Thursday morning preliminary to an order fixing pig iron prices.

Meanwhile a revision of the steel price order of April 17 is expected to be issued in a few days. It is said that the revision will deal with three questions: A request to authorize increased prices on galvanized pipe and galvanized nails, effective subsequent to the "frozen" date of March 31 but prior to April 17; a request to permit maintenance of higher export than domestic prices; a request to equalize freight rates with distant basing points, chiefly to give relief to eastern shippers moving steel all-rail to the Pacific Coast.

A leading producer of ferroalloys on Tuesday reaffirmed pre. nt prices for third quarter business. The announcement covered ferromanganese, ferrochrome, silicon, vanadium and other ferroalloys.

Tubular Goods

. . . OPM to allocate orders for large pipe lines

Line pipe business which has no semblance of national defense use is being turned down right and left. Inquiry from a Midwest company involving 55,000 tons of various sizes ranging from 12 to 26 in. has found no takers yet. The 850,000 tons of 20 and 24 in. pipe involving two long lines is expected to be allocated following scrutiny of wide continuous mill capacity capable of plate production now being gathered by OPM. The OPM probably will allocate pipe tonnage required for essential lines. This action may be taken within a few days.

Some steel men are of the opinion that the 850,000 tons of plates required for these lines would so seriously cripple the crowded ship plate schedules that the lines may be abandoned in favor of more railroad tank cars which could be produced more easily.

Gulf Oil Co., which has been attempting to buy 50,000 tons or 500 miles of 10 in. pipe has placed some, if not all, of this tonnage with National Tube Co., Jones & Laughlin Steel Corp., and Spang, Chalfant & Co. A portion of this business may carry promises unsatisfactory to Gulf, with the result that the latter may attempt to find additional suppliers.

Wire Products

. . . Items not vital to defense may be curtailed

Big order backlogs, problems in getting semi-finished steel, rationing of zinc and nickel, several rapid changes in defense requirements and a rather ominous outlook for certain peace-time consumption fields are high spots of the market picture.

Already jammed with orders for merchant products, producers may be forced to curtail sharply on some items not vital to the defense program. Jobbers have been attempting to build up exceptionally large inventories, but in many cases strong demand has prevented the accomplishment of this.

CLEVELAND producers would be glad to have a definition of where items for argicultural areas fit into the current national economic picture. A small mill in northern Ohio has been idle due to a strike and the cessation of shipments has hampered certain non-defense users and a few firms contributing indirectly to the armament program.

The amount of wire business going to national defense endeavor is increasing rapidly and correspondingly purely commercial commitments are being further delayed as far as delivery is concerned, according to PITTSBURGH reports.

Sheets and Strip

. . . Non-defense orders to be greatly retarded

Commercial sheet and strip users without defense orders are completely in the dark as to when they will receive much of the material now on the order books. The one thing certain, according to PITTSBURGH reports, is that domestic consumers will wait somewhat longer than was thought a month ago, despite heavy pressure from expediters. Automobile companies have been definitely told by some sheet makers that deliveries will be retarded if the production of automotive material interferes with the making of plates for uses which take preferential ratings.

Shipments to the automotive in-

dustry from CLEVELAND and YOUNGSTOWN mills were exceptionally heavy last week. The motor car makers are applying strenuous pressure for deliveries. No over-night change in the output of CLEVELAND mills has occurred yet, but it is expected output of plates from continuous mills will be doubled ultimately. This will mean curtailment of some of the heavy hot rolled sheet tonnage which has been growing larger during recent months. However, heavy hot rolled sheets cannot be shut off entirely, as they are a defense program item. Late last week a big inquiry for 10 and 14-gage sheets for the Navy desired for shipment in 10 days was only one of various defense tonnages crowding mill schedules and forcing non-defense orders back farther.

Restriction in galvanizing activities in CHICAGO has taken place. One appliance manufacturer submitted a substantial inquiry this week and was told by several mills that they weren't interested in galvanized business. Sheet production for defense is increasing and steel men look for formal curtailment in manufacture of household appliances and other so-called non-essential requirements.

Non-defense users' orders are being slashed in some instances as much as 30 per cent to accommodate the ever-increasing rearmament business.

Bolts, Nuts and Rivets

. . . Orders above output, making distribution difficult

Definitions of essential consuming fields are becoming more necessary for CLEVELAND bolt and nut producers, due to the multitude of industries they serve. With orders above output it is often difficult to make decisions fair to all, particularly when dealing with such far-flung fields as mill supply houses, the agricultural industry, export trade and countless other classifications.

Merchant Bars

. . . Commercial orders being pushed back by preference ratings

Steel mills are definitely interpreting the recent steel preference order to mean that all bar business carrying priority or preference ratings is to be made and shipped ahead of non-defense material when such curtailment is necessary in order to meet the proper promises made on the defense business having preferential ratings. PITTSBURGH steel makers have already adopted this procedure, which means that further pushing back of commercial deliveries is in order.

Heavy purchases of shell steel for Canada was the highlight last week for CLEVELAND producers. Small size hot rolled bars for cold finishers are the bulk of the output at CLEVELAND.

A CHICAGO mill reported its alloy orders this week called for less tonnage than at any time this year. Same source extended its deliveries on carbon bars to 10 to 12 months. Bar backlogs there are generally filled for the rest of the year though some insertions may still be made.

Iron Ore

. . . Steel expansion will require more Great Lakes ships

Construction of additional Great Lakes ore vessels would be required under the proposed expansion of the steel industry, but until the areas for blast furnace expansion are determined the number of ships needed cannot be forecast. Presumably a large portion of the stacks would be in the Great Lakes area.

Only about 10 or 12 medium size Canadian vessels will be available to American iron ore shippers under the new law permitting Canadian ships to carry ore between American ports.

Coke

. . . Republic starts Alabama ovens long idle

Republic Steel Corp. has placed 100 beehive coke ovens in operation at Virginia coal mine near Birmingham and expects to return the remaining 50 to production in two to three weeks. Production from 150 ovens, idle since 1917, is expected to approximate 300 tons daily.

Tin Plate

. . . Operations at virtual capacity

Tin plate operations remain at virtual capacity and in some cases beyond this point, with every indication that this tempo will continue for months to come. The allocation of British requirements is a foregone conclusion.

Plates

. . . Large tonnage allocated for ships . . . railroads get preference

The Office of Production Management has allocated 323,990 tons of shapes, mostly for naval and merchant ships. Details of the formal awards are published on another page under the heading "New Business." This is the tonnage mentioned in THE IRON AGE two weeks ago as having been tentatively allocated.

On Monday Price Administrator Leon Henderson, who has charge of allocation of steel for non-defense industries, issued an order which gives first call to railroads over all other civilian industries. It is not clear why the railroads are placed in the non-defense category, but it is worthy of note that the job of giving preference ratings on essential material is thus divided between OPM and OPACS.

For two large pipe lines 850,000 tons of steel is required. If the pipe is to be made from plates, a further burden will be placed on plate mills and continuous sheet-strip mills.

Steel companies understand that plates for cars and locomotives are to be given preference along with shipbuilding steel and are acting accordingly.

Mills which have been producing light gage plates on sheet mills at PITTSBURGH are expected to further curtail non-essential sheet production following the recent statement by OPM that ship and railroad car plates must be put ahead of ordinary sheet business.

Formal distribution of plates for ship programs, plus awarding of preference ratings to freight car builders, are seen by Philadelphia interests as practically ending shipments of plates to non-defense industries. The ship plate allocation announced by OPM is largely a formal statement of a policy which had been previously been inaugurated by district mills. Deliveries of these ship tonnages will extend into the third quarter of 1943. In addition to the distribution announced by OPM, it is understood that an additional 22,000 tons of bent plate have been placed with Lukens Steel Co.

Machine Tools

. . . SALES, INQUIRIES AND MARKET NEWS

Inquiries for Heavy Machines

New York

• • • **Buying of machine tools** on the part of instrument makers, particularly those making bombsights, has predominated in the past month, but recent inquiries indicate a shift will take place to some of the heavier industries. Aircraft business is also pending. There has been surprisingly little activity in special shell turning lathes, particularly for the larger calibers. Some sales of automatics have been made for turning shell from bar stock, up to the 75-mm. armor piercing shell.

Price ceilings on used equipment have tended to reduce profits for dealers inasmuch as original sellers expect to get the ceiling price and this leaves no margin for turnover. Some manufacturers are holding back on disposing of idle equipment and dealers look to direct action on the part of OPM to pry this machinery loose.

Deliveries Being Shortened

Chicago

• • • **With output stepped up** each month since the first of the year, with trainees beginning to take their place as regulars, with plant additions mostly in use, the ceiling in output will soon be reached, some machine tool executives believe. Indications of shortening deliveries already can be seen. Most builders report that they are now meeting deliveries on time or a little ahead.

Temporary slump in new business is expected to die when the flood of aircraft orders comes in soon. Machine tools for Buick's new aircraft engine plant here are well into production. More will be needed though because of the practically definite decision to double Buick's original commitments.

100,000 Tools for Aircraft

Cleveland

• • • **Lease-lend buying** is brisk and letters of intent soon will go to 20 or 22 auto and aircraft companies for the enlarged aircraft program. These firms, all of them in the aircraft program at present, will require 100,000 machine tools.

Lees-Bradner and Cleveland Pneumatic Tool have been among the leading purchasers of machine tools here recently. Formal orders from Jack & Heintz have been coming through. Announcement of another new lathe plant would not be surprising sooner or later.

The northwestern Ohio area seems active. National Machinery at Tiffin has been buying. Defiance, Findlay and Fostoria contain new projects which are the subject of inquiry. The new propeller plant at Toledo will require equipment. Willys-Overland has been in the market right along.

To Decentralize Priorities

Cincinnati

• • • **Announcement during** the past week that a branch of the priorities office will be set up in the Cincinnati area, particularly to assist machine tool men, will tend to bring more efficiency from a situation, which at best, is fraught with many difficult problems. Some complaint has been heard among the manufacturers of changes in ratings or shift of priority after machines were in production and that this had caused some complications.

Further increase in the production in this area is anticipated with the opening of the new plant of the Nebel Machine Tool Co. this week, and with the opening of further plants during the ensuing month. New business continues to follow the pattern that has been established throughout the year.

Non-Ferrous Metals

. . . MARKET ACTIVITIES AND PRICE TRENDS

New York, June 10.—With consumers, particularly civilian users, still scrambling for any amount of copper, lead, zinc and tin they can put their hands on, a number of inequitable situations have arisen which would seem to require still further government control over distribution of non-ferrous metals. A large share of this confusion arises from the half measures which have been taken in past control moves, and the lack of full interpretation of the orders, rather than through any desire to circumvent the controls.

Demand for lead and tin, the only important metals still comparatively free of Federal control, continues unabated, with the past week's sales in both metals showing new buying waves.

While no official statement has been made, it apperas that some 50,000 tons of copper will be allocated in June to consumers holding defense contracts or having high preference ratings, after the emergency pool requirements have been taken care of. This will leave about 55,000 to 60,000 tons, including foreign metal, for sellers to distribute among civilian consumers. Thus far no action has been taken on the question of bringing high cost domestic producers into the picture. The problem of shipping is causing some concern over possibility of Latin American mines not being able to meet scheduled delivery rates. Pricewise, the copper situation is unchanged, with producers adhering to 12c. a lb., Connecticut Valley, and custom smelters at 12.50c.

Zinc

Refined production of zinc in May gained to 64,657 tons from 63,210 tons in April, while deliveries rose to 63,638 tons from 62,974 tons in April. The slighter greater increase in production, as compared with shipments, resulted in a gain of 1019 tons of stocks to 8305 tons at the end of May. Export shipments of 1192 tons were reported in May, the first such shipments reported in the past six months. The rise in refined production in May was due largely to the longer work period, as daily average shipments showed a minor loss to 2086 tons, against 2110 tons in April.

Lead

Unusually heavy sales in the past week have given rise again to the possibility of some type of formal control over lead. There was no substantiation of this view in Washington, however. Despite the heavy buying, the metal appears to be evenly distributed among consumers, with no production suffering from lack of supplies. Heavy use of foreign lead, in face of rising ocean rates may force some action with respect to passing on the added shipping costs to users. Whether such a step will be in the form of a horizontal increase or the Government absorbing the import tax, is uncertain. Meanwhile, prices are unchanged at 5.70c., St. Louis, and 5.85c. New York.

Tin

Fears over outcome of Dutch East Indies-Japanese trade negotiations brought out an unusually heavy demand for tin last week, with as much as 1000 tons estimated to have been sold on Friday. Buying centered largely on afloats and practically all such material available through July is believed to have been contracted for. Buying in first two days of this week has been more moderate, the price advances being due to the shortage of afloat metal. Price movements during the peak of the buying were very moderate, being limited to ½c. with the gain for the entire week up to today only ¾c.

(*non-ferrous prices on page* 137)

Scrap . . . MARKET ACTIVITIES AND QUOTATION TRENDS

With practically every district reporting movement of scrap as being below consumption requirements, the scrap market is rapidly approaching a crisis. Some mills are still protected by moderate inventories built up prior to May 10, but many other producers are in a very critical position. One eastern mill may be forced to curtail open hearth operations this week if its receipts are not sharply increased.

Growth of "vest pocket" agreements, forced on the trade by ambiguities in the official price order, is plaguing both dealers and sellers and adding to the confusion. Too, there appears to be considerable overgrading, or dilution of grades, particularly cast grades, which is not conducive to a free movement.

Reports of hoarding by dealers in anticipation of higher prices appear to be exaggerated. However, some yards have material not moving because of lack of labor for processing. How the present impasse can be broken is a problem still lacking an answer satisfactory to all interests involved, but it is generally agreed that a means of attracting remote scrap would alleviate the situation somewhat.

Details of distribution of scrap exports to Britain are not yet available, but it appears possible that several Florida ports may be added to list of acceptable points of origin. THE IRON AGE scrap composite is unchanged at $19.17.

Trading in scrap is exempt from inventory control, until material is sold to the consumer, according to an interpretation of the General METALS ORDER No. 1 by the *OPM*. Those who gather scrap and sell it to dealers are thus exempt from the necessity of filing monthly inventory reports. Text of the interpretation is as follows: "Only persons, firms or corporations selling iron and steel scrap to persons, firms or corporations which consume iron and steel scrap shall be deemed to be 'suppliers,' and such buyers shall be deemed to be 'customers' as defined in said order."

The government schedule of maximum prices of iron and steel scrap was published in the May 15 issue of THE IRON AGE and is not repeated this week. The prices will be reprinted in the event of any changes in the schedule.

Pittsburgh

Little or no change in activity is noted here from a week ago. Small orders continue the rule and brokers still await clarification of the recent scrap order. The ability of steel mills to utilize up to $1 in equalizing freight rates when in competition with closer points within a consuming area has produces some relief in this district. Scrap from long distances, however, is not reaching this district.

Chicago

Short-selling has practically disappeared here. Transactions are still restricted. There is noticeable less complaint about the $1 freight differential in some quarters, though there are still plenty who feel the order needs clarification. Unprepared scrap is not coming to Chicago as freely as it has in the past. Generally, there is no denying the fact that material is scarcer.

Philadelphia

With movement of scrap here still substantially below consumption, a crisis is rapidly approaching. At least one district mill is threatened with forced curtailment of part of its melting operations if its daily receipts of scrap and pig are not stepped up this week. Dealers' yards are generally quite bare, little evidence of hoarding being visible, although in several instances lack of sufficient labor is delaying breaking up of cast machinery. Mills are now generally refusing to accept billing of No. 2 bundles at same price as No. 2 heavy melting, thus placing No. 2 bundles back at the ceiling price of $16.75, delivered. Dealers' No. 1 bundles, however, are still acceptable at same price as No. 1 hydraulic compressed black sheets.

Birmingham

Movement of scrap into this district is extremely limited and mills and foundries are having difficulty obtaining material. Both dealers and brokers are endeavoring to develop new sources of supply. This market remains in a confused state and the trade is still awaiting price clarification from the Government.

New York

Supply situation in this district is causing serious concern. Material is much too slow in coming into the market to satisfy the needs of industry. Exports to Canada are estimated at 1300 tons for the past month and about 2500 tons will be shipped in the present month. The material is going by barge to Buffalo and thence to Canadian mills.

Boston

New England consumers are pushed for scrap. That is particularly true of the American Steel & Wire, doing business on a f.o.b. price basis. Washburn Wire Co. has bought No. 1 steel at $15.50 and No. 2 at $14.50 delivered. Steel is going to eastern Pennsylvania via barge for which $14 a ton on the ground was paid by shipper, which compares with $14.06, on cars, offered by the American Steel & Wire.

Toronto

New buying is developing on a broader scale in the markets here with dealers extending all efforts to meet consumers' demands. Dealers report substantial improvement in offerings from producing plants, auto wreckers and small collectors, with consumers needs more than keeping pace with supply. Persistent brisk demand prevails for machinery cast and stove plate with supply below demand and wide price spreads reported on individual transactions.

Youngstown

Amount of scrap coming in here remains well below normal and there are no prospects for relief. A reflection of the situation in ingot output ultimately is quite likely, especially since railroad production of scrap is declining while production of auto scrap also may fall off.

Cleveland

District salesmen for two steel companies with headquarters elsewhere have been attempting to round up scrap here recently, which seems to indicate that the movement is below normal in several parts of the Midwest. During May, 11 vessels brought scrap to this port, against 22 in April and 15 in May, 1940. From present indications a further drop will be shown during June.

Cincinnati

With established prices on stove plate still out of line, that material has practically disappeared from the district market and is now being included in other cast grades. Exact appraisal of the general market is difficult, as some feeling persists among the dealers that price maladjustments are merely emphasizing a relative scarcity of material that was already beginning to manifest itself.

Detroit

Scrap continues to move in a desultory fashion. There is still an unusual amount of difficulty in supplying foundries with cast material. It is understood that whatever material is available cannot be moved at today's prices.

April Steel Sheet Output Rises To 108%, Plates Climb To 88%

• • • **Production of steel sheets** in April reached 107.8 per cent of capacity, or 1,166,873 net tons, compared with 107.3 per cent and 1,199,469 tons in March, according to the American Iron and Steel Institute's monthly report on "production for sale" of iron and steel products. Plates in April were produced at the rate of 88 per cent, compared with 87 per cent in March, while output of structural shapes reached 92.5 per cent, or 383,469 net tons, a sharp gain over the March figures of 85.1 per cent and 374,135 tons.

During the first four months of 1941 sheet production averaged 106.1 per cent and totaled 4,590,197 net tons, while plate output averaged 86.1 per cent, and totaled 1,746,013 net tons.

The total of steel products made during April was 5,269,748 net tons, compared with 5,411,319 net tons in March.

AMERICAN IRON AND STEEL INSTITUTE
Capacity and Production for Sale of Iron and Steel Products

April - 1941 (PERIOD)

		Number of companies	Items	Annual Capacity Net tons	Production for Sale—Net Tons: Current Month: Total	Current Month: Per cent of capacity	Current Month: Shipments: Export	Current Month: Shipments: To members of the industry for conversion into further finished products	Year to Date: Total	Year to Date: Per Cent of capacity	Year to Date: Shipments: Export	Year to Date: Shipments: To members of the industry for conversion into further finished products
STEEL PRODUCTS	Ingots, blooms, billets, slabs, sheet bars, etc.	32	1	xxxxxxx	420,289	xxx	38,543	155,726	2,071,059	xxx	617,359	560,942
	Heavy structural shapes	8	2	5,038,200	383,469	92.5	12,758	xxxxxxx	1,448,735	87.4	70,573	xxxxxxx
	Steel piling	4	3	332,000	24,382	89.3	4,652	xxxxxxx	87,223	79.9	10,921	xxxxxxx
	Plates—Sheared and Universal	19	4	6,168,590	446,653	88.0	27,235	1,907	1,746,013	86.1	155,555	8,592
	Skelp	8	5	xxxxxxx	96,618	xxx	15,681	38,090	349,122	xxx	50,184	147,200
	Rails—Standard (over 60 lbs.)	4	6	3,613,600	175,650	59.1	4,185	xxxxxxx	606,776	51.1	31,389	xxxxxxx
	Light (60 lbs. and under)	6	7	302,800	16,410	65.9	6,574	xxxxxxx	66,996	67.3	26,838	xxxxxxx
	All other (Incl. girder, guard, etc.)	2	8	102,000	2,021	24.1	345	xxxxxxx	7,712	23.0	1,385	xxxxxxx
	Splice bar and tie plates	15	9	1,300,200	71,162	66.5	1,255	xxxxxxx	252,355	59.0	6,966	xxxxxxx
	Bars—Merchant	35	10	xxxxxxx	521,970	xxx	33,358	52,280	2,140,948	xxx	225,824	237,373
	Concrete reinforcing—New billet	16	11	xxxxxxx	118,972	xxx	13,206	xxxxxxx	455,367	xxx	77,236	xxxxxxx
	Rerolling	17	12	xxxxxxx	16,788	xxx	873	xxxxxxx	45,814	xxx	3,486	xxxxxxx
	Cold finished—Carbon	19	13	xxxxxxx	104,619	xxx	2,195	xxxxxxx	398,708	xxx	7,895	xxxxxxx
	Alloy—Hot rolled	15	14	xxxxxxx	143,957	xxx	10,091	12,310	538,642	xxx	49,696	51,035
	Cold finished	15	15	xxxxxxx	15,955	xxx	2,117	xxxxxxx	57,251	xxx	7,373	xxxxxxx
	Hoops and baling bands	5	16	xxxxxxx	8,787	xxx	636	xxxxxxx	32,637	xxx	1,456	xxxxxxx
	TOTAL BARS	52	17	12,194,785	931,048	92.8	67,552	64,590	3,669,367	91.5	372,966	288,408
	Tool steel bars (rolled and forged)	15	18	127,870	10,319	98.1	607	xxxxxxx	35,751	85.0	2,781	xxxxxxx
	Pipe and tube—B. W.	13	19	2,049,200	134,153	79.6	13,199	xxxxxxx	505,712	75.0	38,626	xxxxxxx
	L. W.	8	20	885,260	41,101	56.4	4,615	xxxxxxx	155,993	53.6	10,994	xxxxxxx
	Electric weld	4	21	462,520	36,963	97.1	1,926	xxxxxxx	129,450	85.1	3,389	xxxxxxx
	Seamless	15	22	3,105,440	199,623	74.2	15,678	xxxxxxx	696,111	68.1	63,921	xxxxxxx
	Conduit	6	23	152,145	11,541	92.2	267	xxxxxxx	44,162	88.2	671	xxxxxxx
	Mechanical Tubing	12	24	467,725	39,706	103.2	3,267	xxxxxxx	152,124	98.9	16,066	xxxxxxx
	Wire rods	18	25	xxxxxxx	128,377	xxx	10,473	24,021	510,251	xxx	57,798	87,667
	Wire—Drawn	36	26	2,291,250	177,910	94.4	13,777	1,863	704,269	93.4	52,241	7,534
	Nails and staples	19	27	1,120,610	69,702	75.6	6,646	xxxxxxx	278,417	75.5	22,382	xxxxxxx
	Barbed and twisted	16	28	458,210	24,385	64.7	5,836	xxxxxxx	94,938	63.0	20,995	xxxxxxx
	Woven wire fence	15	29	771,180	28,993	45.7	123	xxxxxxx	111,739	44.1	811	xxxxxxx
	Bale ties	11	30	114,730	7,877	83.4	--	xxxxxxx	23,553	62.4	40	xxxxxxx
	All other wire products	5	31	24,280	558	27.9	--	xxxxxxx	1,996	25.0	--	xxxxxxx
	Fence posts	14	32	136,445	6,523	58.1	145	xxxxxxx	23,461	52.3	421	xxxxxxx
	Black plate	11	33	341,235	34,917	124.4	2,146	--	124,208	110.7	5,163	8
	Tin plate—Hot rolled	7	34	352,700	23,541	81.1	1,897	xxxxxxx	84,290	72.7	4,541	xxxxxxx
	Cold reduced	10	35	3,520,640	241,697	83.4	21,659	xxxxxxx	847,369	73.2	72,222	xxxxxxx
	Sheets—Hot rolled	24	36	xxxxxxx	660,525	xxx	25,578	18,866	2,573,870	xxx	112,725	76,130
	Galvanized	14	37	xxxxxxx	154,651	xxx	10,995	xxxxxxx	613,606	xxx	44,718	xxxxxxx
	Cold rolled	16	38	xxxxxxx	283,268	xxx	4,659	xxxxxxx	1,130,467	xxx	22,645	xxxxxxx
	All other	14	39	xxxxxxx	68,429	xxx	1,832	xxxxxxx	272,254	xxx	7,756	xxxxxxx
	TOTAL SHEETS	27	40	13,154,510	1,166,873	107.8	43,064	18,866	4,590,197	106.1	187,844	76,130
	Strip—Hot rolled	23	41	3,200,380	166,930	63.4	5,234	22,620	679,638	64.6	27,818	90,254
	Cold rolled	34	42	1,385,260	103,954	91.2	1,961	xxxxxxx	391,989	86.0	6,357	xxxxxxx
	Wheels (car, rolled steel)	5	43	422,825	21,212	61.0	--	xxxxxxx	83,838	60.3	151	xxxxxxx
	Axles	4	44	472,280	15,821	40.7	228	xxxxxxx	58,290	37.5	382	xxxxxxx
	Track spikes	11	45	327,275	16,677	61.9	414	xxxxxxx	58,937	54.8	1,289	xxxxxxx
	All other	5	46	10,600	2,693	308.8	--	xxxxxxx	6,131	175.8	79	xxxxxxx
	TOTAL STEEL PRODUCTS	131	47	xxxxxxx	5,269,748	xxx	331,942	327,683	20,698,172	xxx	1,941,118	1,266,735
	Pig iron, ferro manganese and spiegel	24	48	xxxxxxx	579,988	xxx	44,107	173,258	2,549,494	xxx	178,849	765,100
	Ingot moulds	4	49	xxxxxxx	56,665	xxx	180	xxxxxxx	239,163	xxx	562	xxxxxxx
IRON PRODUCTS	Bars	9	50	109,195	5,366	59.7	7	344	20,070	55.9	9	1,049
	Pipe and tubes	3	51	109,300	5,301	58.9	237	xxxxxxx	20,498	57.0	359	xxxxxxx
	All other	2	52	71,000	1,753	30.0	414	--	6,764	29.0	1,181	--
	TOTAL IRON PRODUCTS (ITEMS 50 to 52)	11	53	224,995	12,420	67.1	658	344	47,332	64.0	1,549	1,049

Total Number of Companies Included - 148

The estimated average yield of products for sale from ingots produced by the companies included above is 71.2 *%, which applied to their total ingot capacity equals* 57,533,200 *net tons of finished rolled products. Production for sale, less shipments to members of the industry for further conversion, related to the estimated yield is as follows:*

Current month 4,942,065 *N. T.;* 104.4 *%*
Year to date 19,431,437 *N. T.;* 102.7 *%*

Construction Steel

. . .STRUCTURAL STEEL, REINFORCING BARS, PLATES, PILING, ETC.

Fabricated Steel

Lettings of 22,500 tons more than double those of a week ago; new projects of 25,425 tons are slightly lower; plate awards only 975 tons.

AWARDS

NORTH ATLANTIC STATES

1650 Tons, Brooklyn, Brooklyn-Battery Tunnel, to Bethlehem Steel Co., Bethlehem, Pa.

1235 Tons, Harrisburg, Pa., Dauphin County court house, to Bethlehem Steel Co., Bethlehem, Pa.

1000 Tons, Schenectady, N. Y., extension to diesel locomotive shop for American Locomotive Co., to American Bridge Co., Pittsburgh.

470 Tons, Nutley, N. J., Hoffman-LaRoche, Inc., buildings, to Lehigh Structural Steel Co., Allentown, Pa.

320 Tons, Philadelphia, power plant for Westinghouse Electric & Mfg. Co., to Ingalls Iron Works Co., Pittsburgh plant.

275 Tons, Portsmouth, N. H., bridge for Navy, to Haarman Steel Co., Holyoke, Mass.

250 Tons, Portsmouth, N. H., guard house and arch bridge for Navy, to American Bridge Co., Pittsburgh.

205 Tons, Troy, N. H., State bridge, to American Bridge Co., Pittsburgh.

190 Tons, Middletown, Pa., airplane engine repair building, to Lehigh Structural Steel Co., Allentown, Pa.

184 Tons, Devon, Conn., turbine generator supports for power house, to Bethlehem Steel Co., Bethlehem, Pa.

160 Tons, Pedricktown, N. J., three ordnance warehouses, to Schacht Steel Construction Co., New York.

115 Tons, Cranston, R. I., bridge No. 1.60 for New York, New Haven & Hartford Railroad Co., to American Bridge Co., Pittsburgh.

110 Tons, Gardiner, N. Y., bridge No. 142 for Ulster County, to American Bridge Co., Pittsburgh.

100 Tons, Middle River, Md., administration building for Glenn L. Martin Co., to Ingalls Iron Works Co., Pittsburgh plant.

100 Tons, Niagara Falls, N. Y., furnace steel work for Vanadium Corp. of America, to Bethlehem Steel Co., Lackawanna, N. Y.

THE SOUTH

3243 Tons, Anniston, Ala., 17 Army warehouses; 1913 tons for 10 warehouses to Ingalls Iron Works Co., Birmingham, and 1330 tons for seven warehouses to Southern Steel Works Co., Birmingham. This is a correction of item in THE IRON AGE of May 29 stating that Ingalls Iron Works Co. received an award of 3200 tons for warehouse.

3050 Tons, Richmond, Va., viaduct for Seaboard Airline Railway Co., to Bethlehem Steel Co., Bethlehem, Pa.

3000 Tons, Wichita Falls, Tex., five double hangars, to Mosher Steel Co., Dallas, Tex.

1187 Tons, Memphis, Tenn., buildings for Fisher Body Division, General Motors Corp., to Indiana Bridge Co., Muncie, Ind.

300 Tons, Bessemer, Ala., extension to Pullman-Standard Car Mfg. Co. plant, to Ingalls Iron Works Co., Birmingham.

200 Tons, Yorktown, Va., warehouse No. 3, mine depot, to an unnamed fabricator.

CENTRAL STATES

3000 Tons, Chicago, brass rolling mill, Revere Copper & Brass, Inc., to Bethlehem Steel Co., Bethlehem, Pa.

1200 Tons, Burlington, Iowa, power house; 800 tons to Illinois Steel Bridge Co., Jacksonville, Ill., 400 tons to Vierling Steel Works, Chicago.

500 Tons, LaPorte, Ind.; 300 tons for black powder pellets line, 200 tons artillery primer line for government, to Mississippi Valley Structural Steel Co., Decatur, Ill.

300 Tons, Savanna, Ill., government inert storage warehouses at proving ground, to Mississippi Valley Structural Steel Co., Decatur, Ill.

311 Tons, Falls City, Neb., State highway bridge, to Capitol Bridge Co.

120 Tons, Warrenhurst, Ill., State bridge, route FA-131, section 59-SF, to American Bridge Co., Pittsburgh.

WESTERN STATES

1800 Tons, Ogden, Utah, additional warehouses Hill Field, to Kansas City Structural Steel Co., Kansas City, Kan.

600 Tons, Las Vegas, Nev., and Phoenix, Ariz., hangar doors (United States Engineer Invitation 207), to Consolidated Steel Corp., Orange, Tex.

375 Tons, San Francisco, Randolph Telephone Exchange, to Moore Dry Dock Co., Oakland, Cal.

BERMUDA

167 Tons, airplane ramp for U. S. Army, to Ingalls Iron Works Co., Pittsburgh plant.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

6000 Tons, Long Island City, N. Y., manufacturing plant for Sperry Gyroscope Co.

425 Tons, Dansville, N. Y., bridge PSC-4716.

415 Tons, Baltimore, foundry for American Brake Shoe & Foundry Co.

400 Tons, Livingston County, N. Y., highway bridge; bids June 18.

265 Tons, Willimantic, Conn., Windham High School gymnasium.

250 Tons, Dorchester, Mass., Bird Street bridge.

220 Tons, Branchville, Md., State overpass.

215 Tons, Pittsburgh, reconstruction Liberty bridge roadway.

210 Tons, New York, roadway and pedestrian bridge.

170 Tons, Quonset Point, R. I., pontoon assembly parts for Navy.

165 Tons, Rahway, N. J., power house for Merck & Co.

160 Tons, Hempstead, N. Y., State bridge PSC-8141.

155 Tons, Pittsburgh, building for Mine Safety Appliances Co.

100 Tons, Granby, Conn., State bridge.

100 Tons, North Tonawanda, N. Y., addition for Durez Plastics & Chemicals, Inc.

100 Tons, Buffalo, addition for Otis Elevator Co.

100 Tons, Niagara Falls, N. Y., substation addition for E. I. du Pont de Nemours & Co.

THE SOUTH

3000 Tons, State of Oklahoma, highway projects; bids June 17.

698 Tons, State of Arkansas, two highway bridges; S. N. Dickson, Warren, Ark., low bidder on 470 tons, J. P. McNulty, Pine Bluff, Ark., low bidder on 228 tons.

245 Tons, Webster, W. Va., State bridge.

CENTRAL STATES

4300 Tons, Indianapolis, ordnance plant for Navy Department.

1700 Tons, Dayton, Ohio, hangars, test laboratory and operating bridge, Wright Field, for War Department.

1006 Tons, State of Kansas, highway bridges, including 106 tons to be awarded June 7 and 900 tons, June 11.

750 Tons, La Grange, Ill., factory addition for General Motors Corp., Electro-Motive division.

650 Tons, Mount Vernon, Iowa, State bridge.

550 Tons, Arapahoe, Neb., State bridges.

510 Tons, Painesville, Ohio, State project No. 58; bids June 17.

428 Tons, State of Illinois, two highway bridges; bids June 13.

275 Tons, Elkhorn, Neb., State viaduct FAGM-183-3-3.

255 Tons, Draper, S. D., State viaduct.

205 Tons, Allouez, Wis., ore dock spouts, dock No. 4 for Great Northern Railway.

200 Tons, East Union, Ohio, State project No. 60, Wayne County bridge No. WA-30-167; bids June 17.

190 Tons, Dancy, Wis., State bridge No. 538.

185 Tons, Jeffersonville, Ind., warehouses, Camp Powers, for War Department.

130 Tons, Kieferville, Ohio, Blanchard River State bridge.

120 Tons, Hudson, Iowa, State bridge FSN-502.

110 Tons, Streator, Ill., repairs, bridge No. 154.85 for New York Central Railroad Co.

100 Tons, Kiefervil'e, Ohio, Putnam County State project No. 59; bids June 17.

Weekly Bookings of Construction Steel

Week Ended →	June 10, 1941	June 2, 1941	May 13, 1941	June 11, 1940	Year to Date 1941	Year to Date 1940
Fabricated structural steel awards	22,500	11,100	22,500	17,550	708,460	335,830
Fabricated plate awards	975	1,580	735	1,345	70,710	65,475
Steel sheet piling awards	200	0	1,580	0	16,955	16,440
Reinforcing bar awards	9,100	8,300	13,685	6,700	296,800	296,800
Total Letting of Construction Steel	32,775	20,980	38,500	25,595	1,092,925	714,545

WESTERN STATES

250 **Tons,** Oregon and Washington points, Bonneville Administration substation structures (Invitation 1933); bids in.

100 **Tons,** Mountain Home, Idaho, Anderson Ranch Dam and power plant, tunnel supports and liner plates (Specification 965); bids July 7.

FABRICATED PLATES

AWARDS

975 **Tons,** Georgia and Tennessee, 31 tanks for Gulf Oil Co.p., to Chicago Bridge & Iron Co., Chicago.

SHEET PILING

AWARDS

200 **Tons,** Corpus Christi, Tex., Naval Air Station, to Bethlehem Steel Co., Bethlehem, Pa.

Reinforcing Steel

Awards of 9,100 tons; 8,300 tons in new projects.

AWARDS

ATLANTIC STATES

2000 **Tons,** Philadelphia, two shipways at Cramp Shipbuilding plant, to Bethlehem Steel Co., Bethlehem, Pa.; Turner Construction Co., contractor.

700 **Tons,** Boston, Navy Yard manufacturing unit, to Joseph T. Ryerson & Son, Inc., Cambridge, Mass., through Thomas O'Connor & Co., Boston, contractor.

360 **Tons,** Pine Camp, N. Y., mesh for paving, to Truscon Steel Co., Youngstown, through John W. Cowper Co., Buffalo, general contractor.

233 **Tons,** South Amboy, N. J., mesh for route 4, section 1-B, to Truscon Steel Co., Youngstown, through C. S. Malanka & Son.

230 **Tons,** West Springfield-Holyoke, Mass., State road, to Northern Steel Co., Boston.

185 **Tons,** Rensselaer, N. Y., mesh for R. C. 41-11, to Truscon Steel Co., Youngstown, through Louis Longhi & Sons.

150 **Tons,** Deer Park, N. Y., State hospital reception buildings, to Bethlehem Steel Co., Bethlehem, Pa.

100 **Tons,** East Hartford, Conn., dike, to Truscon Steel Co., Boston.

100 **Tons,** Leominster, Mass., addition to filtration plant, to Northern Steel Co., Boston, through James A. Monroe & Sons, North Attleboro, Mass., contractors.

100 **Tons,** Cambria County, Pa., mesh for route 221, section 8, to Truscon Steel Co., Youngstown, through M. Bennett & Sons.

SOUTH AND CENTRAL

1275 **Tons,** Stickney, Ill., sewage treatment works, division J., to Joseph T. Ryerson & Son, Inc., Chicago.

481 **Tons,** Corpus Christi, Tex., mesh for Naval air station, to Truscon Steel Co., Youngstown, through Brown Bellows Co.

300 **Tons,** Cleveland, bars for Cleveland Graphite Bronze Co. plant, to Paterson-Leitch Co., Cleveland, through Albert M. Higley Co., Cleveland.

215 **Tons,** Norfolk, Va., administration building for Naval base, to Truscon Steel Co., Youngstown, through Doyle & Russell, general contractor.

200 **Tons,** Wood River, Ill., Standard Oil Co. of Indiana, power house, to Laclede Steel Co., St. Louis.

160 **Tons,** Justis Park, Ill., route 51, section 102-Y, to Bethlehem Steel Co., Bethlehem, Pa.

150 **Tons,** Dayton, Ohio, DeSota-Bass housing, to West Virginia Rail Co., Huntington, W. Va.; Knowlton Construction Co., contractor.

145 **Tons,** Chicago, additions for Santa Fe Railway, to Truscon Steel Co., Youngstown, through Ellington-Miller Co.

120 **Tons,** Portsmouth, Ohio, housing project for colored people, to West Virginia Rail Co., Huntington, W. Va.; C. A. Yeager & Co., contractor.

100 **Tons,** Vevay, Ind., road project to Truscon Steel Co., Youngstown, through Deniston & Garber.

WESTERN STATES

350 **Tons,** Fresno, Cal., Fresno County jail, to Kyle & Co., Fresno, through L. H. Hansen & Sons, Fresno, contractors.

275 **Tons,** San Francisco, National Broadcasting Co. studio, to Columbia Steel Co., San Francisco, through Barrett & Hilp, San Francisco, contractors.

210 **Tons,** Ogden, Utah, welded steel mesh for Hill Field (Invitation 509-41-195), to Colorado Fuel & Iron Corp., Denver.

200 **Tons,** San Francisco, United States Engineer list (Invitation 868-41-214), to Bethlehem Steel Co., San Francisco.

CANAL ZONE

850 **Tons,** Panama Canal, schedule No. 5129, to Jones & Laughlin Steel Corp., Pittsburgh.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

15,000 **Tons,** Brooklyn, Navy Yard shipbuilding drydocks; J. Rich Steers, Walsh Construction Co. and Cauldwell-Wingate joint contractors.

900 **Tons,** Everett, Mass., generating plant, Boston Edison Co.; Thos. O'Connor & Co., contractor.

800 **Tons,** Boston, Navy Yard storehouse for shipbuilding materials; Thos. O'Connor & Co., contractors.

200 **Tons,** Providence, R. I., telephone exchange alterations and additions.

200 **Tons,** Dorchester, Mass., Bird Street bridge.

160 **Tons,** New York, East River Drive, contract 6; bids taken.

154 **Tons,** St. Johnsbury, Vt., overhead viaduct.

100 **Tons,** Sutton, Mass., State bridge.

SOUTH AND CENTRAL

2500 **Tons,** Rock Island, Ill., government arsenal warehouse; bids June 14.

800 **Tons,** South Bend, Ind., Studebaker Corp. plane engine test buildings; bids June 20.

700 **Tons,** State of Kansas, highway projects; bids taken.

250 **Tons,** State of Arkansas, two highway bridges.

150 **Tons,** Superior, Wis., grain elevator.

WESTERN STATES

1100 **Tons,** Benicia, Cal., Army arsenal and wharf (Invitation 868-41-203); bids in.

800 **Tons,** Bremerton, Wash., Navy Yard quay wall (Specification 10,424); General Construction Co., Seattle, low bidder.

567 **Tons,** Friant, Cal., Central Valley project readvertisement (Invitation 48,828-A-1); bids in.

210 **Tons,** Ogden, Utah, steel fabric for Hill Field (Invitation 509-41-235); bids in.

120 **Tons,** Oakland, Cal., International Harvester Co. branch; K. E. Parker Co., San Francisco.

115 **Tons,** Araby, Ariz., steel fabric for Gila project (Invitation 24819-B); bids in.

106 **Tons,** Los Angeles, two State bridges at Bishons Road and North Figuora Street; bids June 26.

CANAL ZONE

1000 **Tons,** Panama Canal, schedule No. 5168; bids taken.

Cast Iron Pipe

Jackson, Tenn., plans pipe line extensions in water system. Cost about $37,000. Financing in that amount has been arranged through Federal aid. John Gasell is city engineer.

General Purchasing Officer, Panama Canal, Washington, asks bids until June 17 for 43,000 ft. of 2 and 4-in. cast iron soil pipe, including bends, hubs, tees, 600 flange unions, 9000 malleable iron unions, 400 malleable iron or steel unions, valves, fittings, etc. (Schedule 5167).

Blanco, Tex., plans pipe lines for water system and other waterworks installation, including steel standpipe and pumping unit. Cost close to $35,000.

Omro, Wis., asks bids until June 26 for 4600 ft. of 8-in. and 1980 ft. of 6-in. cast iron pipe; 3300 ft. of 6-in., 300 ft. of 4-in., and 1120 ft. of 2-in. cast iron or transite pipe; also for valves, water meters, etc. Jerry Donohue Engineering Co., 608 North Eighth Street, Sheboygan, Wis., is consulting engineer.

Bucyrus, Ohio, plans pipe line extensions in water system in parts of Sears, Myers, Ferry and other streets. Fred C. Judd, director of public service is in charge.

Board of Public Works, Columbus, Ind., has engaged Greeley & Hansen, 6 North Michigan Avenue, Chicago, consulting engineers, to make surveys and estimates of cost for expansion in municipal water system, including pipe lines, elevated steel tank and tower, water-softening equipment, filtration plant, new pumping equipment in present station and other work.

United States Engineer Office, 751 South Figueroa Street, Los Angeles, has let contract to Vinson & Pringle, Phoenix, Ariz., at $99,904.98 for water supply system at airport at Las Vegas, Nev., including pipe lines and other equipment (Circular 197).

Council Grove, Kan., plans pipe line extensions and improvements in water system. Proposed to arrange bond issue of $80,000 for this and other waterworks installation.

Pipe Lines

Magnolia Petroleum Co., Magnolia Building, Dallas, Tex., subsidiary of Socony-Vacuum Oil Co., New York, has authorized new welded steel pipe line from gas field in Jackson County, southwestern part of Texas, to Beaumont, Tex., about 200 miles, for natural gas transmission to latter place for fuel service for local oil refinery of company, and other operations in that district. Greater part of new line will be 14-in. Compressor stations and other operating facilities will be installed to develop capacity of 60,000,000 cu. ft. of gas per 24 hr. Cost over $1,500,000.

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for about 680,000 ft. of 18-in. bituminous lined and coated steel pipe, and accessories, for main water line for naval station at Key West, Fla. (Specification 10317).

Town Council, Gueydan, La., closes bids June 17 for pipe lines for municipal natural gas system, including main welded steel line for connection with supply source, distribution lines, fittings, couplings, regulators, meters and accessories. F. P. Joseph, Glenmora, La., is consulting engineer.

Southern Natural Gas Co., Watts Building, Birmingham, has completed financing in amount of $13,000,000, considerable part of proceeds to be used for extensions in pipe lines and other facilities. Contract has been let to Ford, Bacon & Davis, Inc., 39 Broadway, New York, engineer and contractor, for expansion now approved, including new 14-in. welded steel pipe line from recently developed gas field at Logansport, Tex., to connection with main pipe line system at Perryville, La., near Monroe, La., gas field district, about 130 miles; also new pipe line to parallel present lines for part of distance, extending from Monroe area to Birmingham and thence to Atlanta and other points in Georgia, crossing under Mississippi River near Vicksburg, Miss., for natural gas transmission for distribution in districts mentioned, consisting of about 102 miles of 22-in., and 19 miles of 12-in. welded steel pipe. Project will include extensions in eight compressor stations and several new stations for booster service, requiring 18 or more gas engine-driven compressor units with capacity of 17,300 hp. A dehydration plant will be built in new Logansport gas field, noted, for removal of moisture from gas in that area, which will be developed for a flow capacity of about 700,000,000 cu. ft. per 24 hr. Entire project will cost close to $7,000,000, and will be carried out at once.

Augusta, Ark., plans pressure pipe line system for natural gas distribution, including main welded steel pipe line for connection with supply source, control station and other operating facilities. Cost about $50,000.

Richfield Oil Corp., 555 South Flower Street, Los Angeles, has let contract to Macco-Robertson Co., 815 Paramount Boulevard, Clearwater, Cal., for new 10-in. welded steel pipe line from connection with natural gas pipe line system of Pacific Lighting Corp., near Kettleman Hills, Bakersfield, Cal., to company refinery in Coles levee district, about 10 miles, for natural gas transmission for fuel service at latter point.

Prices of Finished Iron and Steel...

Steel prices on these pages are f.o.b. basing points (in cents per lb.) unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extas, deductions, and in most cases freight absorbed to meet competition.

Basing Point → / ↓ Product	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	
Long ternes[2]	3.80¢		3.80¢									4.55¢			
Wrought iron	4.75¢														
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢		
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢		
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢								
Commodity C-R	2.95¢			2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢		
TIN PLATE Standard cokes (Per 100-lb. base box)	$5.00	$5.00	$5.00						$5.10						
BLACK PLATE 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ ([10])			
TERNES, MFG. Special coated (Per base box)	$4.30		$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢		
Reinforcing (rail)[7]	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢				2.40¢	2.45¢	2.15¢		
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)						
PLATES															
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Coatesville and Claymont = 2.10¢)		2.45¢	2.65¢		2.29¢	2.15¢
Wrought iron	3.80¢														
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)										
SHAPES Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)								
Galvanized	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)								
Spring	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)								
PILING Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			
IRON BARS Common		2.25¢			(Terre Haute, Ind. = 2.15¢)										
Refined	3.75¢														
Wrought	4.40¢														

[1] Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to 29 gage within certain width and length limitations. [6] For merchant trade. [7] Straight lengths as quoted by distributers. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lot to manufacturing trade. [10] Boxed.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher f.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Shell Steel

Basic open hearth shell steel f.o.b. Pittsburgh and Chicago.

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting to length, or quantity. This type of steel is for hot rolled sections used for the forging of shells and includes rounds, round squares, and special sections.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)	*Per Lb.*
Pitsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., $3 a net ton higher. Quantity extras apply.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh; Package, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

WIRE PRODUCTS

(To the Trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham)

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cut nails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	59
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

Note: Birmingham base same on above items, except spring wire.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine and carriage bolts:	
½ in. and smaller by 6 in. and shorter	65½
9/16 and ⅝ in. by 6 in. and shorter	63½
¾ to 1 in. by 6 in. and shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65
Nuts, cold punched or hot pressed, hex. or square:	
½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above items, excepting plow bolts, additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts	U.S.S.	S.A.E.
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full container lots, 10 per cent additional discount.

Stove bolts, packages, nuts loose 71 and 10

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago. New York lots of 200 lb. or over.

Stove bolts in packages, with nuts attached	71
Stove bolts in bulk	80

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pitsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws *Per Cent Off List*

Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Filister head cap screws, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

NON-FERROUS PRICES

Cents per lb. for early delivery

	June 4	June 5	June 6	June 7	June 9	June 10
Copper, Electrolytic[1]	12.00	12.00	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00	12.00	12.00
Tin, Straits, New York[2]	52.25	52.25	52.75	....	53.125	53.00
Zinc, East St. Louis	7.25	7.25	7.25	7.25	7.25	7.25
Lead, St. Louis[3]	5.70	5.70	5.70	5.70	5.70	5.70

[1] Mine producers' quotations only, delivered Conn. Valley. Deduct ¼c. for approximate New York delivery price. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Products

Cents per lb., Delivered

Tin	New York	Cleveland
Straits pig	52.75	55.00
Copper		
Electro	13.00	13.50
Castings	12.50	13.00
H. R. Sheets*	20.12	20.12
Seamless tubes*	20.62	20.62
Brass		
Yellow sheets*	18.65	18.65
Yellow, rods*	13.67	13.67
Seamless tubes*	21.40	21.40
Zinc		
Slabs	Nom'al	Nom'al
Sheet, No. 9 casks	Nom'al	Nom'al
Lead		
American pig	6.85	6.35
Bar	8.70	8.85
Cut sheets	9.00	91.0
Antimony		
Asiatic	16.00	17.00
Aluminum		
Virgin, 99%	20.00	21.00
No. 1 remelt, 98-99%	18.00	18.50
Solder		
½ and ½	32.00	32.75
Babbitt		
Anti-friction grade	23.50	21.75

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their use.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper		
Hvy. crucible	10.75	11.375
Hvy. and wire	9.75	10.25
Light and bottoms	8.75	9.25
Brass		
Heavy	6.25	6.75
Light	5.25	6.00
No. 1 yel. turn	6.00	6.50
No. 1 red or compo. turnings	9.50	10.50
Hvy. Mach. compo.	9.75	10.00
Lead		
Heavy	5.00	5.50
Aluminum		
Cast	11.00	12.00
Sheet	12.00	13.50
Zinc	....	5.10

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 17c.-18c. a lb.; No. 12 remelt No. 2, standard, 16c. a lb. NICKEL electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICKSILVER, $180-$182. per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 13.25c. a lb.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 32½; on brass sheets and rods, 40; on brass tubes, 33⅓, and copper tubes, 40.

ALLOY STEEL

Alloy Steel Blooms, Billets and Slabs

Base per gross ton, f.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem.....$54.00

Alloy Steel Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade .....2.70c.
Delivered, Detroit .....2.80c.

S.A.E. Series Numbers	Alloy Differential, per 100 Lb.
2000 (1.5 Ni)	$0.35
2100 (1.5 Ni)	0.75
2300 (3.5 Ni)	1.70
2500 (5 Ni)	2.55
3100 Ni-Cr	0.70
3200 Ni-Cr	1.35
3300 Ni-Cr	3.80
3400 Ni-Cr	3.20
4100 Cr-Mo (0.15 to 0.25 Mo.)	0.55
4100 Cr-Mo (0.25 to 0.40 Mo.)	0.75
x4340 Cr-Ni-Mo	1.70
4340 Cr-Ni-Mo	1.85
4600 Ni-Mo (0.2-0.3 Mo, 1.5-2 Ni)	1.20
5100 (0.60-0.90 Cr)	0.35
5100 (0.80-1.10 Cr)	0.45
5100 Cr spring steel	0.15
52-100 Cr. (electric furnace)	2.60
6100 Cr-V bar	1.20
6100 Cr-V spring steel	0.85
C-V	0.85

The above differentials are for hot rolled finished products. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. Delivered Detroit, 3.45c. carlots.

Alloy Steel Plates

Base per lb., f.o.b. Pittsburgh, Chicago and Coatesville.

Open hearth grade .....3.50c.

STAINLESS AND HEAT-RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

Chromium-Nickel

	No. 304	302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium

No.	410	430	442	446
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
H'tstrip	17.00c.	17.50c.	24.00c.	35.00c.
C'ld st.	22.00c.	22.50c.	32.00c.	52.00c.

20% Chromium-Nickel Clad Steel

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

TOOL STEEL

(F.o.b. Pittsburgh)

	Base per Lb.
High speed	67c.
High-carbon-chromium	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

ELECTRICAL SHEETS

(F.o.b. Pittsburgh)

	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. dock, San Francisco or Los Angeles or Seattle	56.00

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall

(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
1 in. o.d. 13 B.W.G.	$9.01	$7.82	....
1¼ in. o.d. 13 B.W.G.	10.67	9.26	....
1½ in. o.d. 13 B.W.G.	11.70	10.23	$9.72
1¾ in. o.d. 13 B.W.G.	13.42	11.64	11.06
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d. 13 B.W.G.	16.76	14.54	13.79
2¼ in. o.d. 12 B.W.G.	18.45	16.01	15.16
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d. 12 B.W.G.	21.42	18.59	17.54
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66
4½ in. o.d. 10 B.W.G.	43.04	37,35	35.22
5 in. o.d. 9 B.W.G.	54.01	46.87	44.25
6 in. o.d. 7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought iron pipe)

Base Price = $200 Per Net Ton

Butt Weld

Steel	Black	Galv.
⅛ in.	56	33
¼ to ⅜ in.	59	40½
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron	Black	Galv.
¼ and ⅜ in.	+9	+33
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18

Lap Weld

Steel		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
7 and 8 in.	65	52½
9 and 10 in.	64½	52
11 and 12 in.	63½	51
Wrought Iron		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
9 to 12 in.	28½	12

Butt weld, extra strong, plain ends

Steel	Black	Galv.
⅛ in.	54½	38½
¼ to ⅜ in.	56½	42½
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron		
¼ and ⅜ in.	+10	+46
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½

Lap weld, extra strong, plain ends

Steel		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
7 and 8 in.	65½	53
9 and 10 in.	64½	52
11 and 12 in.	63½	51
Wrought Iron		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21
7 and 8 in.	38½	21½
9 to 12 in.	32	17½

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.

ORES

Lake Superior Ores

Delivered Lower Lake Ports

	Per Grosss Ton
Old range, bessemer, 51.50%..	$4.75
Old range, non-bessemer, 51.50%	4.60
Mesaba, bessemer, 51.50%....	4.60
Mesaba, non-bessemer, 51.50%	4.45
High phosphorus, 51.50%.....	4.35

Foreign Ores*

C.i.f. Philadelphia or Baltimore, Exclusive of Duty

	Per Unit
African, Indian, 44 to 48% Mn.	57c. to 61c.
African, Indian, 49 to 51% Mn.	60c. to 65c.
Brazilian, 46 to 48% Mn..	54c. to 59c.
Cuban, del'd, duty free, 51% Mn.	67½c. to 71c.

	Per Short Ton Unit
Tungsten, Chinese, Wolframite, duty paid, delivered....	$23 to $24
Tungsten, domestic, scheelite, delivered	$23.00
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton; South African (low grade).....	Nom.
Rhodesian, 45%	$25.00
Rhodesian, 48% ...	$28.00 to $30.00

RAILS, TRACK SUPPLIES

F.o.b. Mill	
Standard rails, heavier than 60 lb., gross ton.....	$40.00
Angle bars, 100 lb.	2.70
F.o.b. Basing Points	
Light rails (from billets), gross ton	$40.00
Light rails (from rail steel), gross ton	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast.....	2.30c.
Track bolts, steam railroads...	4.15c.
Track bolts, discount to jobbers all sizes (per 100 counts)....	65-5

Basing points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minneaqua, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond, Va.

FLUORSPAR *Per Net Ton*

Domestic washed gravel, 85-5 f.o.b. Kentucky and Illinois mines, all rail.....$20.00 to	$21.00
Domestic, f.o.b. Ohio River landing barges .....20.00 to	21.00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines....20.00 to	21.00
Foreign, 85% calcium fluoride, not over 5% Si., c.i.f. Atlantic ports, duty paid.....	Nominal
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines....	31.00
As above, in bags, f.o.b. same mines	32.60

REFRACTORIES

Fire Clay Brick	*Per 1000 f.o.b. Works*
Super-duty brick at St. Louis..	$60.80
First quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey.....	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri, and Illinois	42.75
Second quality, New Jersey....	9.00
No. 1 Ohio.....	39.90
Ground fire clay, per ton.....	7.10
Silica Brick	
Pennsylvania $47.50	
Chicago District	55.10
Birmingham	47.50
Silica cement, net ton (Eastern)	8.55

Chrome Brick	*Net per Ton*
Standard f.o.b. Baltimore, Plymouth Meeting and Chester...	$50.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	
Magnesite Brick	
Standard f.o.b. Baltimore and Chester $72.00	
Chemically bonded, f.o.b. Baltimore	61.00
Grain Magnesite	
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks).....(—)*	
Domestic, f.o.b. Baltimore and Chester in sacks.....$40.00	
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

*None available.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload).....$120.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%.....$36.00
Domestic, 26 to 28%..... 49.50

Electric Ferrosilicon

Per Gross Ton, Delivered Lump Size

50% (carload lots, bulk).....$74.50*
50% (ton lots, packed)..... 87.00*
75% (carload, lots, bulk)....135.00*
75% (ton lots, packed).....151.00*

Bessemer Ferrosilicon

Per Gross Ton, F.o.b. Jackson, Ohio

10.00 to 10.50%.....$34.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2% $1 per ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton, F.o.b. Jackson, Ohio

5.00 to 5.50%.....$28.50

For each additional 0.5% silicon up to 11%, 50c. a ton is added. Above 11% add 75c. a ton.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots Lump Size, on Contract

4 to 6% carbon.....11.00c.
2% carbon .....17.50c.
1% carbon .....18.50c.
0.10% carbon .....20.50c.
0.06% carbon .....21.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon $113.00*
2.50% carbon 118.00*
2% carbon 123.00*
1% carbon 133.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W, del. carload..... $2.00
Ferrotungsten, 100 lb. and less 2.25
Ferrovanadium, contract, per lb. contained V, del'd $2.70 to $2.90†
Ferrocolumbium, per lb. contained columbium f.o.b. Niagara Falls, N. Y., ton lots ..... $2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C. f.o.b. furnace carload and contract, per net ton.....$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C. f.o.b. furnace, carload and contract per net ton.....$157.50
Ferrophosphorus, electric or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton 58.50
Ferrophosphorus, electrolytic 23-26% in carlots, f.o.b. Monsato (Siglo), Tenn., 24% per gross ton, $3 unitage, freight equalized with Nashville 75.00
Ferromolybdenum, per lb. Mo., f.o.b. furnace ..... 95c.
Calcium molybdate, per lb. Mo, f.o.b. furnace ..... 80c.
Molybdenum oxide briquettes 48-52% Mo, per lb. contained Mo, f.o.b. Langeloth, Pa. 80c.
Molybdenum oxide, in cans, per lb. of contained Mo, f.o.b. Washington, Pa. ..... 80c.

*Spot prices are $5 per ton higher.
†Spot prices are 10c. per lb. of contained element higher.

FUEL OIL

No. 3, f.o.b. Bayonne, N. J.....4.90c.
No. 6, f.o.b. Bayonne, N. J.....3.21c.
No. 5 Bur. Stds., del'd Chicago..3.25c.
No. 6 Bur. Stds., del'd Chicago..2.75c.
No. 3 distillate ,ed'd Cleveland.5.875c.
No. 4 indus., del'd Cleveland....5.50c.
No. 5 indus., del'd Cleveland....5.25c.
No. 6 indus., del'd Cleveland...4.875c.

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, prompt .....$6.00 to $6.25

Foundry, f.o.b. Connellsville, prompt .....$6.75 to $7.00

F'dry, by-product, Chicago..... 10.50

F'dry, by-Product, New England 13.75

Foundry, by-product, Newark or Jersey City .....$12.45 to 12.95

F'dry, by-product, Philadelphia. 12.13

F'dry, by-product, Cleveland... 12.30

F'dry, by-product, Cincinnati... 11.75

Foundry, Birmingham 8.50

F'dry, by-product, St. Louis $10.75 to $11.00

BRITISH

Per Gross Ton, f.o.b. United Kingdom Ports

Ferromanganese, export £29 16s. 3d.

Tin plate, per base box. 32s. to 33s.

Steel bars, open hearth..£16 10s.

Beams, open hearth....£19 10s.

Channels, open hearth...£19 10s.

Angles, open hearth....£15 10s.

Black sheets, No. 24, gage £22 5s. max.* £22 5s. min.**

Galvanized sheets, No. 24 gage £25 12s. 6d max.*; £25 12s. 6d. min.**

*Empire markets only.
**Other than Empire markets.

PIG IRON (Per Gross Ton)

Prices delivered various consuming points indicated by bold italics

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos.
Boston	***$25.50***	***$25.00***	***$26.50***	***$26.00***	.....
Brooklyn	***27.50***	.....	.....	***28.00***	.....
Jersey City	***26.53***	***26.03***	***27.53***	***27.03***	.....
Philadelphia	***25.84***	***25.34***	***26.84***	***26.34***	.....
Bethlehem, Pa.	$25.00	$24.50	$26.00	$25.50	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....
Steelton, Pa.	.....	24.50	.....	.....	29.50
Birdsboro, Pa.	25.00	24.50	26.00	25.50	29.50
Sparrows Point, Md.	25.00	24.50	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....
Sharpsville, Pa.††	24.00	23.50	24.50	24.00	.....
Buffalo	24.00	23.00	25.00	24.50	29.50
Cincinnati	***24.44***	***24.61***	.....	***25.11***	.....
Canton, Ohio	***25.39***	***24.89***	***25.89***	***25.39***	.....
Mansfield, Ohio	***25.94***	***25.44***	***26.44***	***25.94***	.....
St. Louis	***24.50***	***24.02***	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	.....
Granite City, Ill.	24.00	23.50	24.50	24.00	.....
Cleveland	24.00	23.50	24.50	24.00	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....
Toledo	24.00	23.50	24.50	24.00	.....
Youngstown††	24.00	23.50	24.50	24.00	.....
Detroit	24.00	23.50	24.50	24.00	.....
St. Paul	***26.63***	.....	***27.13***	***26.63***	.....
Duluth	24.50	.....	25.00	24.50	.....
Birmingham	20.38	19.00	25.00	.....	.....
Los Angeles, San Francisco and Seattle	***27.50***	.....	.....	.....	.....
Provo, Utah	22.00	.....	.....	.....	.....
Montreal†	27.50	27.50	.....	28.00	.....
Toronto†	25.50	25.50	.....	26.00	.....

GRAY FORGE		CHARCOAL	
Valley or Pittsburgh fce.	$23.50	Lake Superior fce.	$28.00
		Delivered Chicago	31.34

Base prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Delivered prices on Southern iron for shipment to Northern points are 38c. a ton below delivered prices from nearest Northern basing point on iron with phosphorus content of 0.70 per cent and over. †On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

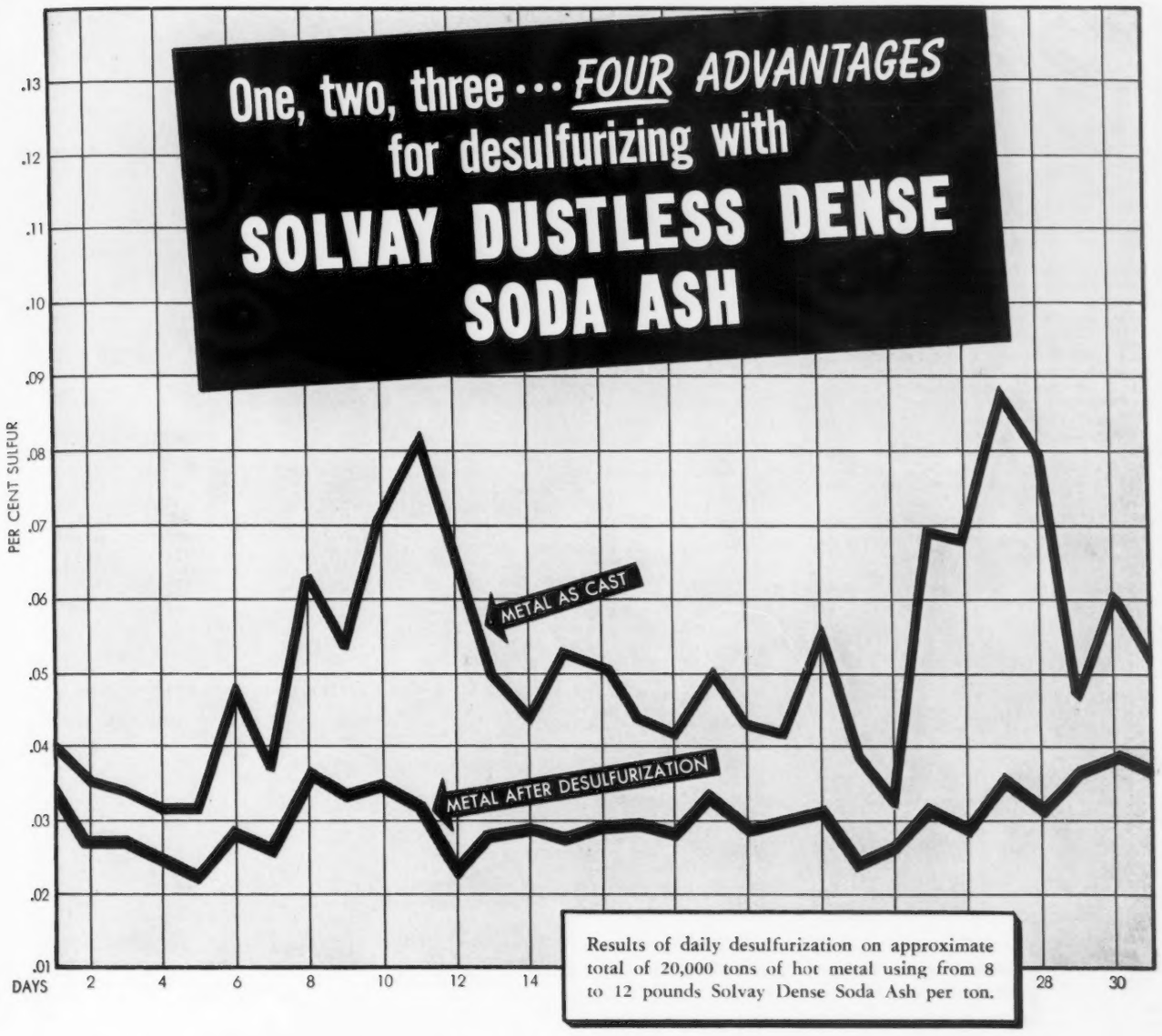
††Pittsburgh Coke & Iron and Struthers furnaces are quoting $24.50 a ton for No. 2 foundry, basic and malleable, and $25.00 a ton for bessemer iron at Sharpsville and Youngstown.

WAREHOUSE PRICES

	Pittsburgh	Chicago	Cleveland	Philadelphia	New York	Detroit	Buffalo	Boston	Birmingham	St. Louis	St. Paul	Milwaukee	Los Angeles
Sheets, hot rolled	$3.35	$3.05	$3.35	$3.75	$3.58	$3.43	$3.25	$3.71	$3.45	$3.39	$3.30	$3.38	$4.30
Sheets, cold rolled	....	4.10	4.05	4.05	4.60	4.30	4.30	3.68	....	4.12	4.35	4.23	6.50
Sheets, galvanized	4.75	4.60	4.62	5.00	5.00	4.84	4.75	5.11	4.75	4.24	4.75	4.98	5.25
Strip, hot rolled	3.60	3.40	3.50	3.95	3.96	3.68*	3.82	4.06	3.70	4.99	3.65	3.73	....
Strip, cold rolled	3.20	3.30	3.20	3.31	3.51	3.20	3.52	3.46	....	3.61	3.83	3.54	....
Plates	3.40	3.55	3.40	3.75	3.76	3.60	3.62	3.85	3.55	3.69	3.80	3.68	4.15
Structural shapes	3.40	3.55	3.58	3.75	3.75	3.65	3.40	3.85	3.55	3.69	3.80	3.68	4.15
Bars, hot rolled	3.35	3.50	3.25	3.85	3.84	3.43	3.35	3.98	3.50	3.64	3.75	3.63	4.15
Bars cold finished	3.65	3.75	3.75	4.06	4.09	3.80	3.75	4.13	4.43	4.02	4.34	3.88	6.60
Bars, ht. rld. SAE 2300	7.20	7.10	7.55	7.31	7.60	7.67	7.35	7.50	....	7.72	7.45	7.58	9.55
Bars, ht. rld. SAE 3100	5.75	5.65	5.85	5.86	5.90	5.97	5.65	6.05	....	6.02	6.00	5.88	8.55
Bars, cd. drn. SAE 2300	8.15	8.15	8.40	8.56	8.84	8.70	8.40	8.63	....	8.77	8.84	8.63	10.55
Bars, cd. drn. SAE 3100	6.75	6.75	7.75	7.16	7.19	7.05	6.75	7.23	....	7.12	7.44	6.98	9.55

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb., galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exceptions; Chicago, galvanized sheets, 500 to 1499 lb.; Philadelphia, galvanized sheets, one to nine bundles, cold rolled sheets, 1000 to 1999 lb.; Detroit, galvanized sheets, 500 to 1499 lb.; Buffalo, cold rolled sheets, 500 to 1500 lb., galvanized sheets, 450 to 1499 lb., cold rolled strips, 0.0971 in. thick; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; Birmingham, hot rolled sheets, strip and bars, plates and shapes, 400 to 3999 lb., galvanized sheets, 500 to 1499 lb.; St. Louis, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb., cold rolled strip 0.095 in. and lighter; Milwaukee, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb.; New York, hot rolled sheets, 0 to 1999 lb., cold rolled sheets, 400 to 1499 lb.; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lbs.; Los Angeles, hot rolled sheets, bars, plates, shapes, cold rolled sheets, 300 to 1999 lb., galvanized sheets, 24 ga.—1 to 6 bundles. Extras for size, quality, etc., apply on above quotations. *12 gage and heavier, $3.43.

One, two, three ··· *FOUR* ADVANTAGES for desulfurizing with SOLVAY DUSTLESS DENSE SODA ASH



Results of daily desulfurization on approximate total of 20,000 tons of hot metal using from 8 to 12 pounds Solvay Dense Soda Ash per ton.

The effective use of Solvay Dustless Dense Soda Ash for control of sulfur in hot metal external to the blast furnace—*is proven practice.* Results of actual operating tests are shown in the illustration.

Solvay Dustless Dense Soda Ash combines the following desirable characteristics:

1. It is a dense, uniform and compact product which is easy to handle.
2. It is *dustless,* resulting in minimum loss of material during handling.
3. It is a granular soda ash which flows easily, fuses quickly and mixes rapidly with molten iron.
4. It is a high purity soda ash which is the most economical commercial source of sodium carbonate. It gives the most *effective* alkali per dollar spent.

Solvay Dustless Dense Soda Ash can be confidently relied upon in blast furnace operation:

1. for control of sulfur outside the furnace.
2. for routine control of sulfur resulting from adjusted slag practice to produce greater tonnage.

Write for full particulars today concerning the use of Solvay Dustless Dense Soda Ash for desulfurization. Write to

60th ANNIVERSARY 1881 • 1941

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40 RECTOR STREET NEW YORK, N. Y.

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Plants Located At: Syracuse, N. Y. • Detroit, Mich. • Baton Rouge, La. • Hopewell, Va.

Sales Possibilities

. . . CONSTRUCTION, PLANT EXPANSION AND EQUIPMENT BUYING

North Atlantic States

• **Rolock, Inc.**, Southport, Conn., wire cloth and kindred wire goods, plans new one-story plant at Fairfield, Conn. Cost over $50,000 with equipment. Lyons & Mather, 211 State Street, Bridgeport, Conn., are architects.

Botwinik Brothers, Inc., Hamden, Conn., reconditioned machine tools and other machinery, is erecting one-story building, 40 x 250 ft., for which general contract recently was let to W-T Construction Co., 865 Chapel Street, New Haven, Conn., for a machine parts storage and distributing shop. Cost close to $50,000 with equipment. Charles H. Abramowitz, 52 Goffe Terrace, New Haven, is architect.

Lapointe Machine Tool Co., Hudson, Mass., broaching machinery and parts, plans expansion for production for Government, which will provide fund of $200,000 through Defense Plant Corp., Washington, for purchase of equipment.

United States Engineer Office, Boston, asks bids until June 16 for two 24-in. pumping units, two gasoline engines and two right-angle gear units (Circular 101).

Hartford Electric Light Co., Hartford, Conn., is arranging bond issue of $4,500,000, proceeds to be used for expansion in steam-electric generating station at South Meadow, including new 45,000-kw. turbine generator, high-pressure boilers and auxiliary equipment.

Bridgeport Moulded Products Co., 300 Myrtle Avenue, Bridgeport, Conn., plastic products, plans new one-story plant, 100 x 120 ft., at Fairfield, Conn. Cost over $75,000 with equipment.

Colonial Beacon Oil Co., 30 Rockefeller Plaza, New York, plans new bulk oil storage and distributing plant in East Shore district, New Haven, Conn., including steel tanks, pumping station and other facilities. Cost over $200,000 with equipment.

Anaconda Wire & Cable Co., 25 Broadway, New York, electrical wires and cables, plans addition to branch plant at Marion, Ind., for production of special assault wire for Government, which will provide fund of $353,723 through Defense Plant Corp., Washington, Federal agency. About $250,000 of amount noted will be used for purchase of equipment, and remainder for land and buildings.

Square D Co., 111 Eighth Avenue, New York, safety electrical switches and devices, with main plants at Detroit and Milwaukee, has leased one-story building at Fifty-first Street and Twenty-third Avenue, Long Island City, for Eastern factory branch, storage and distributing plant.

General Electric Co., Schenectady, N. Y., has approved plans for one-story addition, 60 x 600 ft., for expansion in electric generator shop. Cost over $500,000 with equipment. This is part of 1941 expansion program at plant, which will provide total of 850,000 sq. ft. additional floor space, including structures recently completed.

Charles Pfizer & Co., Inc., 81 Maiden Lane, New York, industrial and other chemicals, is erecting one-story addition, 80 x 200 ft., to plant at 11 Bartlett Street, Brooklyn, for storage and distribution. General contractor is W. J. Barney Corp., 101 Park Avenue, New York. Cost over $60,000 with equipment.

Crouse-Hinds Co., Wolf and Seventh Streets, Syracuse, N. Y., electrical products, has let general contract to J. D. Taylor Construction Co., 115 South Salina Street, for one-story addition, 60 x 500 ft., primarily for a foundry. Cost over $150,000 with equipment. T. Walker Gaggin, First Trust and Deposit Building, is architect.

B. F. Goodrich Co., Fifty-third Street and Buffalo Avenue, Niagara Falls, N. Y., has approved plans for one-story addition, for expansion in synthetic rubber (Keroseal) department. Cost about $325,000 with equipment. Main offices are at Akron, Ohio.

Deere & Co., 125 Marcellus Street, Syracuse, N. Y., agricultural implements and equipment, with main plant at Moline, Ill., have let general contract to Lange-Finn Construction Co., Inc., 240 State Street, Albany, N. Y., for new one-story plant, 120 x 230 ft., at Colonie, N. Y. Cost over $125,000 with equipment.

Allegany Instrument Corp., Allegany, N. Y., Walter Pohlig, president, recently organized to manufacture cutlery, surgical instruments and kindred products, has leased former local Sheffield Farms building and will modernize for plant.

Pittsburgh Metallurgical Co., 3801 Highland Avenue, Niagara Falls, N. Y., has let general contract to C. M. Guest & Son, Anderson, S. C., for new plant for production of ferro-alloys in Tuxbury district, near Charleston, S. C., where about 60 acres recently was acquired. Plant will include electric furnaces, storage and distributing buildings and other structures. Cost close to $1,000,000 with equipment. Contract for electric power supply has been made with South Carolina Public Service Authority, Charleston.

Bakelite Corp., Bound Brook, N. J., plastic products, plans one-story addition, about 190 x 240 ft., for storage and distribution. Cost over $85,000 with equipment. Francisco & Jacobus, 511 Fifth Avenue, New York, are architects and engineers.

Okonite Co., Inc., Passaic, N. J., insulated wire and cables, plans expansion for production of assault wire for Government, which will provide fund of $293,885 through Defense Plant Corp., Washington.

Phelps-Dodge Copper Products Corp., 40 Wall Street, New York, wire and cable and allied copper products, has let general contract to Brown & Matthews, Inc., 122 East Forty-second Street, for two one-story and basement additions to branch plant at Elizabeth, N. J. One of structures will be used for storage and distribution, and other for laboratory and technical service. Cost close to $100,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, has let general contract to Wigton-Abbot Corp., 1225 South Avenue, Plainfield, N. J., and Mahony-Troast Co., 657 Main Avenue, Passaic, N. J., for expansion in storage and distributing buildings, loading and other facilities at naval supply depot, Bayonne, N. J., at $7,723,000, exclusive of equipment.

American Stores Co., 424 North Nineteenth Street, Philadelphia, has approved plans for new bulk food storage and distributing plant at Allentown, Pa. Cost about $150,000 with mechanical-handling equipment and other facilities.

Lebanon Steel Foundry Co., Lebanon, Pa., electric steel castings, has let general contract to John H. Wickersham, 14 South Duke Street, for one-story foundry addition, 45 x 265 ft. Cost over $85,000 with equipment.

Pittsburgh Plate Glass Co., Grant Building, Pittsburgh, has approved plans for four-story addition to safety-glass manufacturing plant at Creighton, Pa., 20 x 225 ft. Cost over $175,000 with equipment.

Case Cutlery Co., Bradford, Pa., has let general contract to Benz Engineering Co., Salamanca, N. Y., for new one-story plant, 90 x 115 ft. Cost close to $65,000 with equipment. T. J. Hendryx, 165 Interstate Parkway, Bradford, is architect.

Westinghouse Electric & Mfg. Co., East Pittsburgh, plans new glass-manufacturing plant adjoining fluorescent lamp works at Fairmont, W. Va., now in course of construction, for requirements for local production and for other glass-converting plants of company in different parts of country. It will consist of two main one-story units, each 275 x 500 ft., and auxiliary structures, with glass tanks and other facilities. Cost about $1,250,000 with equipment.

General Purchasing Officer, Panama Canal, Washington, asks bids until June 16 for floor flanges, galvanized wrought iron or steel pipe straps, pipe extension hangers, cast brass sink traps, brass plugs, cast brass ferrules, basin plugs, flush valves and other equipment (Schedule 5166).

Washington Beef & Produce Co., 440 Eleventh Street, S. W., Washington, meat packer, has asked bids on general contract for one-story addition to packing plant. Cost close to $50,000 with equipment. Morris Fruchtbaum, 400 Chestnut Street, Philadelphia, is engineer.

Procter & Gamble Mfg. Co., 1400 Marriott Street, Baltimore, soaps, oils, etc., plans three one-story additions for copra department, for processing, general production, and for storage and distribution. Cost over $85,000 with equipment. H. K. Ferguson Co., Hanna Building, Cleveland, is engineer. Main offices are in Cincinnati.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until June 17 for globe, stop and check valves for Mare Island Navy Yard, Cal. (Schedule 7098).

The South

• **Continental Oil Co.**, Ponca City, Okla., plans new bulk oil storage and distributing plant at Cuero, Tex., including three 12,000-gal. steel storage tanks, pumping station and other facilities. Cost about $45,000 with equipment. C. M. Reed is division manager at Cuero.

United States Engineer Office, Mobile, Ala., asks bids (no closing date stated) for three pumping stations for water supply at Eglin Field, Valparaiso, Fla., with motor-driven pumping units, including motors, standby equipment and accessories (Circular 414).

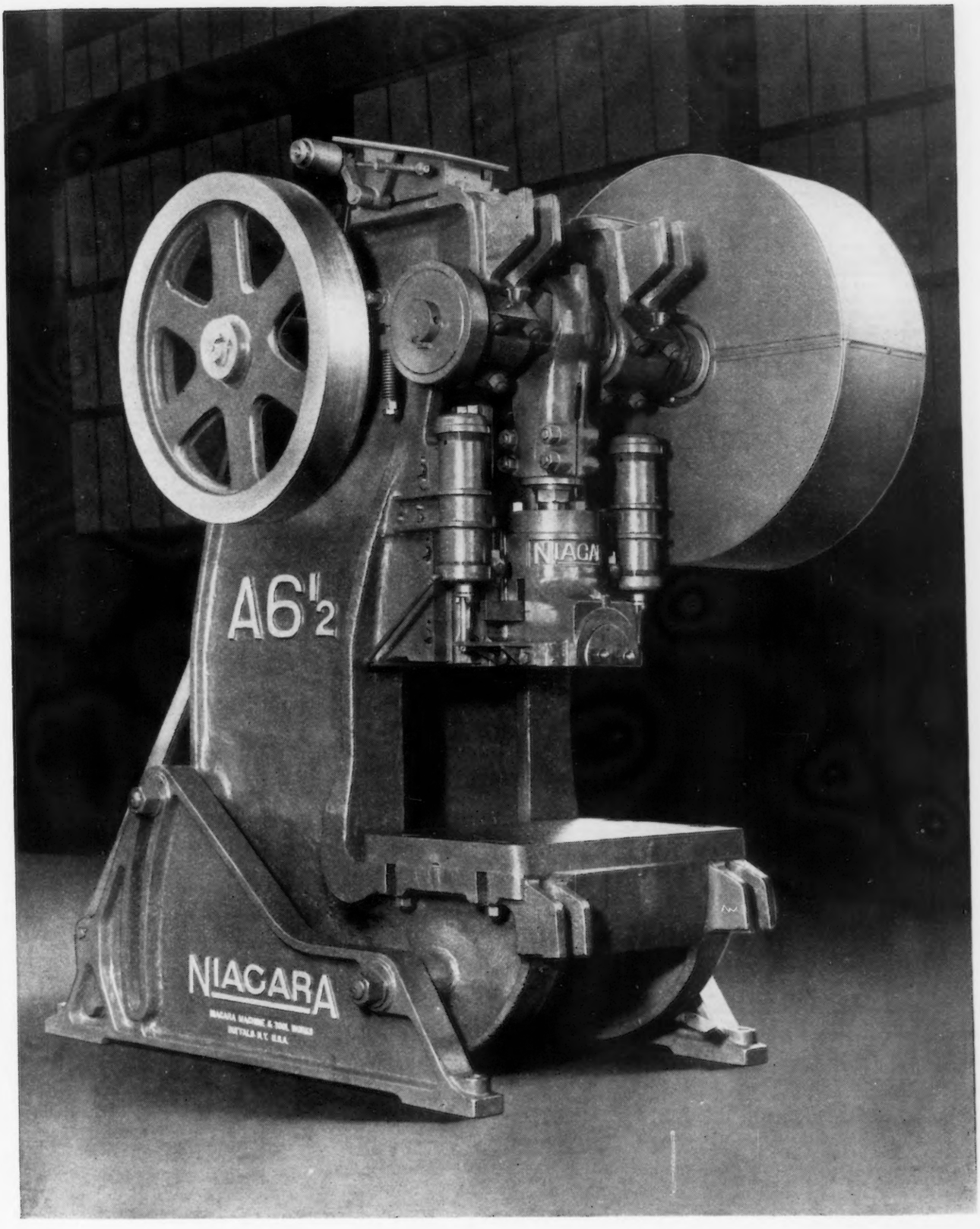
Charleston Shipbuilding & Drydock Co., Charleston, S. C., plans expansion in shipyard on Gadsden Creek, including two new shipways, marine railway, shops and other structures. Cost over $600,000 with equipment.

Nelio Rosin Processing Co., Norwood Street, Jacksonville, Fla., plans new one-story plant at Savannah, Ga. Cost close to $65,000 with equipment. H. M. Wilson is company engineer, first noted address.

United States Engineer Office, Memphis, Tenn., asks bids until June 20 for new Cypress Creek pumping station, including traveling crane, dehumidifying and other equipment.

Arkansas Power & Light Co., Pine Bluff, Ark., will begin work soon on new steam-electric generating plant in gas field in southwestern part of State, to use natural gas as fuel. Cost estimated at $3,000,000, including transmission line, switching station and auxiliary structures. Ebasco Services, Inc., 2 Rector Street, New York, is consulting engineer.

Pursglove Coal Mining Co., Pursglove, Monongalia County, W. Va., plans rebuilding coal tipple, machine shop, oil house, forge and blacksmith shop and auxiliary structures at its No. 1 mine, recently destroyed by fire.



America's foremost industries including aircraft, automotive, electrical and many others are speeding up production with Niagara Series "A" Open Back Inclinable Presses. The Press shown above is one of the complete line built in capacities from 7 to 190 tons. Specifications are given in Bulletin 58 available upon request. Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y. Branches: Cleveland, Detroit, and New York.

Loss about $70,000 with equipment. Main offices are in Standard Building, Cleveland.

Director of Purchases, Tennessee Valley Authority, Old Post Office Building, Knoxville, Tenn., asks proposals (no closing date stated) for following machinery and equipment, both new and rebuilt: Stationary and portable air compressors; machine shop, forge and blacksmith shop, and carpenter shop equipment; cranes, diesel engine or electric-operated shovels of two and three-yard capacity, water pumps, conveyors, equipment for unloading and handling bulk concrete, concrete mixers, aggregate bins, batcher equipment, small gasoline or diesel locomotives, drills, jackhammers, mucking machines, screens, storage bins, crawler-type tractors, bulldozers, road scrapers, earth graders, tunnel dump and flat cars, concrete buckets, concrete forms, etc.

Champlin & Bass, Inc., Magnolia Building, Dallas, Tex., oil operator, plans new gas recycling plant for natural gasoline production in Sejita gas field, near Freer, Tex., including compressor station, boiler house, steel tank units, pumping station, machine shop and auxiliary structures. Cost over $850,000 with equipment.

Gulf Power & Machinery Co., Victoria, Tex., W. H. Smith, head, has let general contract to Edward Wagner, Victoria, for one-story building for shop, storage and distribution service. Cost close to $45,000 with equipment. K. J. Leffland, Victoria National Bank Building, is architect.

Central States

● **National Aluminum & Bronze Foundry Co.,** East Eighty-eighth Street and Laisy Avenue, Cleveland, has let general contract to H. L. Vokes Co., 5300 Chester Avenue, for two-story addition, 20 x 150 ft., for expansion in foundry and machine shop. Cost over $70,000 with equipment.

Safe Cabinet Division, Remington-Rand, Inc., Marietta, Ohio, steel cabinets, etc., plans one-story addition. Cost over $125,000 with equipment. Main offices of parent company are at Buffalo.

Ladel Conveyor & Mfg. Co., Inc., New Philadelphia, Ohio, industrial trucks, conveyors, etc., has approved plans for one-story addition, 70 x 160 ft., for expansion in foundry. Cost over $65,000 with equipment. E. S. Snyder, Cleveland Heights, Ohio, is engineer.

Cleveland Graphite Bronze Co., 880 East Seventy-second Street, Cleveland, bearings, bushings, etc., has let general contract to Albert M. Higley Co., 2036 East Twenty-second Street, for new plant at 16800 St. Clair Avenue, N. E., consisting of main one-story production building, 343 x 680 ft.; one-story foundry, 163 x 250 ft.; two-story personnel building, boiler house, office and auxiliary structures, totaling 400,000 sq. ft., in all. Cost over $2,000,000 with equipment. Company will consolidate present plants at new location for increased output. John H. Graham, Hanna Building, is architect.

Park Drop Forge Co., East Seventy-ninth Street and Gordon Park, Cleveland, drop forgings, automobile crankshafts, etc., plans one-story addition, 150 x 240 ft. Cost close to $160,000 with equipment. A. E. Rowe, 1900 Euclid Avenue, is architect and engineer.

Kingston Products Co., 1415 North Webster Street, Kokomo, Ind., automobile equipment and accessories, plans one-story addition, 120 x 130 ft. Cost over $75,000 with equipment. Henry C. Wolf, 316 Heath Street, Logansport, Ind., is architect.

Constructing Quartermaster, Quartermaster Depot, Jeffersonville, Ind., has let general contract to Pearson Construction Co., Benton Harbor, Mich., at $708,400, exclusive of equipment, for two one-story buildings, each about 182 x 842 ft., at local depot.

General American Transportation Corp., 135 South LaSalle Street, Chicago, railway cars, trucks, castings, etc., is erecting one-story addition to branch plant at East Chicago, Ind., for production of 90 mm. and 75 mm. shell forgings for Government. Cost over $250,000 with equipment.

Carter Carburetor Co., 2830 North Spring Avenue, St. Louis, has let general contract to L. O. Stocker Co., Arcade Building, for three and four-story additions, 120 x 120 ft., and 50 x 120 ft., respectively. Cost over $300,000 with equipment.

Public Works Officer, Ninth Naval District, Great Lakes, Ill., has let general contract to Lecoutour-Parsons Construction Co., 4121 Forest Park Boulevard, St. Louis, at $941,034, exclusive of equipment, for new hangar, assembly and repair shops, and other buildings at Naval reserve aviation base, Robertson, Mo.

Stearman Aircraft Division, Boeing Aircraft Co., Wichita, Kan., has secured fund of $10,000,000 through War Department, Washington, for expansion for production of heavy bombers for Government. Main offices of parent company are at Seattle.

Wilcox-Rich Division, Easton Mfg. Co., Saginaw, Mich., engine valves, valve tappets and other automotive equipment, has let general contract to Fred C. Trier Construction Co., Saginaw, for one-story addition for production of aircraft engine parts for Government; also for new power house. Cost close to $160,000 with equipment.

Vagabond Coach & Mfg. Co., New Hudson, Mich., automobile trailers and parts, has leased one-story building at Brighton, Mich., for new plant. Facilities will be provided for employment of about 100 men.

A.C. Spark Plug Division, General Motors Corp., Flint, Mich., plans one-story addition, about 120 x 290 ft. Cost over $175,000 with equipment.

Stinson Aircraft Division, Vultee Aircraft, Inc., Wayne, Mich., has let general contract to O. W. Burke Co., Fisher Building, Detroit, for one-story addition for expansion in parts production and assembling departments. Cost over $65,000 with equipment. Gordon B. Kaufmann, 627 South Carondelet Street, Los Angeles, is architect. Main offices of parent company are at Vultee Field, near Los Angeles.

Chicago Lock Co., 2024 North Racine Avenue, Chicago, automobile locks, vending machines and parts, etc., plans two-story addition, 50 x 175 ft. Cost over $85,000 with equipment. N. Ronneberg, Inc., 5050 Grand Avenue, is architect and engineer.

Chicago, Indianapolis & Louisville Railway Co., Monon Route, 608 South Dearborn Street, Chicago, plans rebuilding part of engine house and shop facilities at yards at South Hammond, Ill., recently destroyed by fire. Loss about $50,000 with equipment.

Powers Regulator Co., 2720 North Greenview Avenue, Chicago, automatic temperature and humidity control equipment, plans two-story addition, 55 x 125 ft. Cost close to $80,000 with equipment. E. O. Sessions & Co., 120 South LaSalle Street, are engineers.

American Brass Co., Kenosha, Wis., brass, copper and other metal rods, tubing, etc., has let general contract to Austin Co., Cleveland, for one-story addition. Cost over $65,000 with equipment. Main offices are at Waterbury, Conn.

Stolpher Steel Products Corp., 3258 West Fond du Lac Avenue, Milwaukee, sheet metal parts for automotive service, has let general contract to J. G. Jansen Construction Co., 3001 North Thirty-eighth Street, for one-story addition, 100 x 250 ft., for expansion in shearing shop and other departments, with part of space for storage and distribution. Cost close to $100,000 with equipment. F. F. Drolshagen, 647 West Virginia Street, is architect.

Minneapolis-Moline Power Implement Co., Twenty-ninth Street and Minnehaha Avenue, Minneapolis, power-operated farm and agricultural equipment, plans one-story addition, 150 x 300 ft., for production for Government. Cost about $250,000 with machinery.

National Guard, Camp Dodge, Herrold, Iowa, asks bids until June 26 for two steam boilers (Circular 5).

John Deere Tractor Co., Waterloo, Iowa, farm tractors and machinery, parts, etc., has let general contract to J. G. Miller Construction Co., Waterloo, for one-story addition, 65 x 108 ft., for storage and distribution. Cost close to $60,000 with equipment.

Western States

● **Wire & Metal Mfg. Co.,** 4909 Everett Avenue, Vernon, Los Angeles, wire products, metal goods, etc., has let general contract to William P. Neil Co., 4814 Loma Vista Avenue, Vernon, for new one-story plant, 60 x 200 ft., on Alcoa Avenue. Cost close to $75,000 with equipment. Harry T. Miller, 4814 Loma Vista Avenue, is architect.

Western Gear Works, Inc., 417 Ninth Avenue South, Seattle, gears, transmission systems, etc., has let general contract to C. L. Fey, 1224 Fifth Avenue West, for one-story addition, about 60 x 66 ft. Cost close to $45,000 with equipment.

Los Angeles Shipbuilding Co., Inc., Los Angeles Harbor, Los Angeles, plans expansion for construction of vessels for United States Maritime Commission, including one-story mold loft, with storage and distribution facilities, 170 x 620 ft.; forge and blacksmith shop, 60 x 125 ft.; paint shop, 50 x 100 ft., and other structures. Cost about $750,000 with equipment. Earl T. Heitschmidt, 417 South Hill Street, is architect; Ralph Phillips, 816 West Fifth Street, is engineer.

Bureau of Yards and Docks, Navy Department, Washington, plans one-story addition to pattern shop and storage and distributing building at Mare Island Navy Yard, Vallejo, Cal., to cost about $400,000 with equipment; also for one-story utility and transportation buildings, same yard, to cost $100,000 with equipment. Appropriations have been authorized in amounts noted.

Columbia Steel Co., San Francisco, has let general contract to J. H. Pomeroy & Co., Inc., 333 Montgomery Street, for one-story addition to works at Sixteenth and Folsom Street, for storage and distribution. Cost over $350,000 with equipment.

Canada

● **Truscon Steel Co. of Canada, Ltd.,** Walkerville, Ont., plans one-story addition, about 50 x 200 ft. Cost over $85,000 with equipment.

St. John Drydock & Shipbuilding Co., Ltd., St. John, N. B., will begin work on new drydock, with shops and other construction buildings, for repair and reconditioning of large vessels. Contract for construction has been let to Canadian Dredge & Dock Co., Ltd., Harbour Commission Building, Toronto. Cost over $500,000 with equipment.

Ford Motor Co. of Canada, Ltd., Windsor, Ont., has let general contract to Dinsmore-McIntire, Ltd., Windsor, for one-story addition, 225 x 280 ft. Cost over $750,000 with equipment.

Lightning Fastener Co., Ltd., 50 Niagara Street, St. Catharines, Ont., metal products, will begin erection of two-story addition, 40 x 190 ft. C. F. Monk, 399 St. Paul Street, is general contractor. Cost about $85,000 with equipment.

Drummond McCall & Co., Ltd., 930 Wellington Street, Montreal, sheets, sheet metal products, etc., has awarded general contract to A. F. Byers & Co., Ltd., 1226 University Street, for plant addition, to cost about $75,000 with equipment. T. Pringle & Son, Ltd., 485 McGill Street, is engineer.

Craig Bit Co., North Bay, Ont., P. Robertson, 65 Fraser Street, president, has awarded general contract to Carrington Construction Co., Sudbury, Ont., for erection of $60,000 plant for manufacture of diamond drill bits, tools, etc.

John Inglis Co., Ltd., 14 Strachan Avenue, Toronto, boilers, machine guns, etc., has let general contract to A. W. Robertson, Ltd., 57 Bloor Street West, for addition to machine shop. Allward & Gouinlock, 57 Bloor Street West, are architects.